BUREAU OF HYGIENE AND TROPICAL DISEASES.

TROPICAL DISEASES BULLETIN.

Vol. 34.] 1937. [No. 10.

TUBERCULOSIS IN THE TROPICS.

PART I.*

A SURVEY OF TUBERCULOSIS IN THE TROPICS.

By E. COCHRANE, M.D. (Glas.), D.P.H. (Lond.).

Introduction.

The problems associated with the control of tuberculosis in the tropics are steadily attracting more attention.

JAMESON (1934) said, following his tour of the East to investigate at first hand the public health problems to be met with there, "tuberculosis is just as serious a killing disease in many parts of the tropics as it is in Europe."

LANKESTER (1920) in India, WILCOCKS (1928) in East Africa, DAKE (1928) in the Dutch East Indies and BARRETO (1934) in Brazil, have all drawn attention to the seriousness of the health problem in their respective countries. AYCARDO (1934) said tuberculosis was the most serious health problem in the Philippine Islands in rural as well as urban areas. SELWYN-CLARKE (1935) wrote: "Tuberculosis is not a showy 'tropical' disease and for this reason may fail to receive the public attention it merits. It is capable of killing throughout the length and breadth of the Gold Coast, and from a health standpoint is the most important problem for the future."

The only survey we have of the incidence and distribution of tuberculosis throughout the tropics is that of MCKINLEY (1935). Even this gives us but a scanty idea of the extent to which this disease is present, but it is interesting to note that without exception it is considered to be of public health importance in all the countries passed under review.

The original intention of this work was to furnish an account of anti-tuberculosis measures in a small tropical community, to outline the problems encountered in such work, and to describe the methods employed in overcoming them. Before doing this it was considered advisable to undertake a comparative study of the problem in other tropical countries.

The medical officer stationed in the tropics rarely has the time or opportunity for studying the work of other investigators. Further,

* The full list of references will be printed at the end of the second part in the November issue of this *Bulletin*.

apart from a specialized course in tropical diseases, he has received his training from teachers unfamiliar with the aspects of the disease in warm climates. On taking up his duties abroad, he finds with respect to tuberculosis, a very different state of affairs from that which exists in temperate climes. His resources are too often scanty, he may have to deal with a population entirely ignorant of the most elementary laws of hygiene, and he will search his text-books in vain for an answer to the problems of pathology and treatment that face him in his tuberculosis work abroad.

The first part of this work, therefore, has been devoted to selecting, as far as possible, the more important contributions regarding tuberculosis amongst coloured peoples. Also, in certain sections, especially that on pathology, these articles have been set out in considerable detail in the hope that the information contained therein will be of value to those who have to wage a single-handed warfare against this disease.

Epidemiology of Tuberculosis in the Tropics.

Undoubtedly the first observer to arouse interest in this question amongst British workers was CUMMINS (1912) who, as a result of his observations in the Sudan, pointed out that tuberculosis was practically non-existent amongst people living under primitive conditions, but transported from their natural surroundings to a civilized habitat these very people were far more liable to contract the disease.

In France, CALMETTE's (1912) account of tuberculin tests (von Pirquet) in the French colonies furnished an index of the extent of the disease in hitherto unsurveyed countries. ZIEMANN's (1913) article on tuberculosis in the tropics gave further encouragement to the view then slowly gaining ground that tuberculosis was by no means unknown in other than temperate climes. BUSHNELL (1920) has reviewed the various contributions to medical literature during these earlier years and there is no need to cover the same ground.

The advent of the European war, however, stimulated research on a larger scale than had been possible hitherto. Peoples of many races, Africans, Chinese, Indo-Chinese, Malagasy, Polynesians, West Indians, were transported to the various theatres of war. These peoples, many of them without any previous contact with the highly tuberculized Europeans, besides being subjected to the strain of war conditions, adopted a mode of living entirely different from that of their natural surroundings. The result was a heavy mortality rate from tuberculosis and the consequent opportunities for pathological and clinical studies which have since formed the basis for comparison with work of a similar nature throughout the tropics.

The best known of these investigations were those of BORREL (1920) and ROUBIER (1920) with their detailed clinical and pathological findings in members of various coloured races. There followed numerous researches on the part of observers in the United States on the post-mortem findings in Negroes who had succumbed to the disease. The result of these and other findings, which will be referred to later, enable us to understand the force of VASSAL's (1928) dictum that " tuberculosis of primitive peoples has an epidemiology of its own."

CUMMINS (1929) pointed out that acute progressive tuberculosis is not invariable when infection takes place in virgin soil. It is not necessarily a high morbidity that is present following such an infection but a high case mortality. If infection in this virgin soil produces

latent lesions they tend to be well tolerated but should the disease become manifest then the result is serious. If we consider the age period between early childhood and the onset of puberty we find a high degree of resistance to, and little manifestation of, tuberculosis. The dangerous period of infancy with its acute type of tuberculosis has been left behind, in front there is the pubertal period with its threat of the adult form of phthisis ; this childhood period of calm is the one at which tuberculosis mortality is at its lowest. Cummins terms this the larval period and at this stage the fate of the individual often hangs in the balance. In these childhood years good diet and adequate rest, healthy exercise in the open air and freedom from responsibility result in physical fitness and general well being.

At puberty much of this is changed and new stresses and strains assail the body. Here the larval stage with lesions latent and as yet unresolved results often in a considerable degree of auto-inoculation which in turn produces a high degree of tissue allergy in a short time. At the same time but infinitely more slowly there occurs the gradual formation of cellular proliferations and protective barriers of fibrotic tissue, the evidence of spontaneous healing. The existence of unnatural stress or abnormal physiological conditions during this larval period may so increase the degree of auto-inoculation as to bring about, not an established immunity, but manifest leisons and acute disease.

This description by Cummins of the onset of tuberculosis in a serious form is borne out by the investigations made by the South African Institute for Medical Research (1932) amongst the mine labourers on the Witwatersrand. Here the sequence of events amongst " a relatively primitive race impelled to change its manner of living from that of a pastoral and warlike people to one of industrialism associated with increasingly close contact with Europeans and to some extent with urbanization," throws considerable light on what has happened in many other parts of the tropics.

It was found that natives applying for employment who reacted positively to intradermal tests were more liable to develop manifest tuberculosis than those who were negative. It appears that this allergy denoted that resistance to infection was lowered and further, the greater the amount of allergy the lower the resistance. However, that this allergy does bestow some degree of resistance is evident from the observation that the septicaemic type of tuberculosis occurred most often amongst those natives who had not reacted to the test. It seems probable that the evidence of this acute phthisis occurring in native recruits shortly after commencing their mine service can be correlated with the view that in these natives a partially natural tuberculosis modified by environmental circumstances has attained an intermediate stage between the tuberculosis of virgin soil and the localized tuberculosis of the European. In support of this we find that the case mortality in the first year of employment in the mines is twice as high among the natives as it is in the White workers. The investigators considered that there did exist " a biological lack of resistance," unconnected with any risk inseparable from the industry itself and that it was a biological characteristic of Africans nor could it be eliminated save by the adoption of industrialism over a long period of time.

That the recruits to the mines have already come into contact with the infection of tuberculosis was proved by ALLAN (1932) who carried out a series of tuberculin tests in the recruiting territories, the

Transkei and the Ciskei, and found that 74% were positive to 0·1 cc. 1 : 5000 O.T. This exposure to infection in their own kraals did not lead to any great degree of active disease ; it did, however, produce latent lesions which remained controlled under the natural conditions of their home life. Amongst those who sought employment in the mines this latent stage led to manifest tuberculosis due to the crowding together of men in an environment where the housing conditions, the diet and the mode of occupation were completely different.

As CUMMINS has already pointed out, in the European child tuberculosis infection usually occurs during the favourable period of home life and the lesions in the majority of children remain larval. Throughout childhood and adolescence the child encounters a succession of minor re-infections and is thus enabled to build up a degree of resistance which minimizes the risk of active tuberculosis. In the African native there is no gradual progression from stage to stage, he is thrust suddenly into the routine of labour in the mines straight from the kraal. This abrupt environmental change coupled with the lack of resistance which characterizes the African lessens his chances of overcoming the disease.

Another study of the epidemiology of tuberculosis amongst a primitive people, though not inhabitants of the tropics, is furnished by FERGUSON'S (1928) history of the spread of tuberculosis among the Indians of the North American continent. Until the early years of the decade 1870–1880 tuberculosis was, from authoritative accounts, rare among the North American Indians. By 1884, it has flared up in such a fashion as to resemble an epidemic, the death rate actually rose to 90 per 1,000 in 1890. This acute phase lasted throughout two decades and then gradually subsided but the death rate at the time of his report stood at 8 per 1,000, almost twenty times that of the surrounding population.

In the acute phase of the invasion adenitis was the commonest manifestation and affected the Indians at all age periods ; to-day the children who form the third generation rarely show any evidence of adenitis. The first generation of the epidemic, that is, those infected for the first time in the adult age period, suffered heavily, 28·86% fell victims to the disease. The second generation contracted the infection in childhood and was even more severely afflicted, 32·7% died of tuberculosis. The present generation, which forms the third of the series, children of parents tuberculized in childhood, has acquired a certain degree of resistance ; 20·46% of these have succumbed but the ultimate mortality is not expected to exceed 22·6% by the time the fortieth year is reached.

ANDERSON (1928) from a study of the evolution of tuberculosis in Mauritius asserts that in a hitherto unexposed people resistance to the disease begins to be acquired within thirty years of continual exposure, is appreciable in extent after fifty years, while full resistance is developed in more than one hundred but less than two hundred years.

Tuberculin Tests in the Tropics.

During recent years tuberculin testing has been undertaken in most tropical countries. It would be beyond the scope of this work to tabulate all the findings but a few are included in order to obtain some idea of the extent to which the infection has gained a foothold in the tropics.

Information regarding wide scale surveys in Central and South America is lacking but the investigations which have been recorded are significant. KRUMDIECK (1931) testing 800 children in Lima by the von Pirquet and intradermal tests found positive reactions rose from 3·1% under twelve months to 75% in the 10–15 years age group. CAYCEDO (1933) tested, by the von Pirquet method, 3,166 school children in Bogotá, Colombia. At the age of five years, 17·3% reacted positively and this increased to 54·1% among the thirteen year old children. MACHADO and BALDÓ (1934) examined 811 infants and young children in Caracas, Venezuela, the positive reactors ranged from 2·17% at three months to 84·61% at five years. CHAVARRÍA *et al* (1935) working in Costa Rica found that of 1,534 children of all races in urban areas 40–45% were positive to the Mantoux test by the time they reached fourteen years of age. In rural districts the total did not exceed 20% at the same age period.

The extent of tuberculization in some parts of India may be deduced from the investigations of PAI and VENUGOPAL (1926) who carried out von Pirquet tests on 3,372 persons in Madras City, by the end of the first year of life about 40% were infected, 57% at the end of the second year and this rose to 80% in the fifth year.

In the Dutch East Indies, PANETH (1928) in the Karo district, a mountainous area in the Interior of Sumatra, Mantoux tested 7,300 individuals and obtained 74% positive reactors. DJAMIL (1929) carried out a comparative study in two villages in the Sumatran highlands. He noted that 40% reacted positively in a village where home industries were pursued, especially the craft of goldsmith, whereas in another village where the pursuits were mainly agricultural only 20% were positive. In Batavia, DE HAAS (1933) testing 596 Chinese infants and young children by the von Pirquet method obtained 21% positive reactions in the first year of life and 45% in the fourth year. A further series of older children recorded by DE HAAS *et al* (1933) revealed a rise to 80% in the 10–14 year age group.

CALMETTE (1912) published the first account of tuberculin tests in the French Colonies, his table is of great interest in comparison with subsequent investigations, especially in Africa.

Senegal	...	15·1%	positive	to	the	Von Pirquet Test.
Madagascar	...	7·0%	,,	,,	,,	,, ,,
Fr. Guinea	...	1·8%	,,	,,	,,	,, ,,
Ivory Coast	...	8·4%	,,	,,	,,	,, ,,
Fr. W. Indies		41·0%	,,	,,	,,	,, ,,
Indo-China	...	31·4%	,,	,,	,,	,, ,,
Reunion Is.	...	52·4%	,,	,,	,,	,, ,,

MATHIS and DURIEUX (1930) discussing the spread of tuberculosis in French West Africa, point out that by 1930 the general average of positive reactors had risen to 44%. TOULLEC and JOLLY (1932) tuberculin tested 285 African soldiers landing at Marseilles direct from the Ivory Coast; of these, 46% reacted positively, a markedly different result from that of Calmette's twenty years earlier. LEDENTU (1934) tested von Pirquet 12,251 children in the French Cameroons, ranging from infancy to fifteen years of age. In the urban districts 22·5%, in rural districts 15·8%, reacted positively. In the Belgian Congo VAN HOOF *et al* (1926) obtained one-third positive reactions amongst the school children of Stanleyville, while VAN DEN BRANDEN (1926) records that one-half of the adults tested by the von Pirquet method in Léopoldville reacted positively.

In South Africa in a large series of tests 72% of the mine labourers in the Witwatersrand applying for an engagement were positive to 0.1 cc. 1 : 5000 O.T. (Mantoux). Moreover the investigators were of the opinion that by using a less dilute solution of O.T. the total positives would have amounted to nearly 90%. In this connexion CUMMINS (1934) commenting on a group of Africans tested with high dilutions, noted that no fewer than 48·6 reacted to 1 : 10,000,000 O.T. CUMMINS and EVANS (1933) had tested a group of 304 male inmates of a Welsh mental hospital and only 3% reacted to such a high dilution of O.T. In his opinion this reaction to high dilutions on the part of the African Native suggests that there is present a latent infection of such severity as to be barely below the clinical level.

A recent study carried out in Africa by three British observers in widely differing localities has yielded a number of interesting results. BURROWS (1934) made a series of intradermal tests on the Dinkas of the Southern Sudan ; these people are mainly cattle owners and lead a semi-nomadic life. Tuberculosis was unknown among them until the early years of this century when infected aliens, traders from Northern Africa, settled in their midst. Since then the disease has spread slowly throughout the community despite the fact that their customs, habits of life and environment have undergone no change.

3,662 were tested, 0·1 cc. of 1 : 5000 O.T. (Mantoux) Positive 32·7%.

Under 5 years	7·5%.
5–10 years	19·6%.
10–25 years	36·1%.
Over 25 years	50·76%.

WILCOCKS (1934) similarly tested Africans in Tanganyika and of 523 adults of both sexes :—

51% were positive to 0·1 cc. 1 : 500 O.T.
47% ,, ,, ,, ,, 1 : 5,000 O.T.
43% ,, ,, ,, ,, 1 : 50,000 O.T.

He, too, observed that the African Native reacted to a very much more dilute tuberculin than does the European.

MATTHEWS (1934) obtained in Zanzibar, where a medley of races is to be found and constant immigration is maintained in small numbers from the Orient, in the urban area 67% positive male reactors and 64% positive female reactors. In the rural districts the percentages were 26 and 23 respectively. In the age group 20–39 years amongst town dwellers 71% reacted, whilst half of the children had become infected by the tenth year and two-thirds by the twentieth year.

It is evident from these surveys that even in the more remote portions of Africa tuberculous infection is widespread, while in those regions open to contact from other continents there is a high degree of tuberculization.

As HART (1932) stated, it is difficult to make comparisons between the various tuberculin surveys because of the differences in technique and in the strength and potency of Old Tuberculin available in different parts of the world. He advocates a uniform technique and the employment of a tuberculin standardized in terms of potency with the International Standard Tuberculin. One of the difficulties encountered in the tropics is the necessity for making up dilutions of O.T. at frequent intervals. Diluted tuberculin should not be used after

fourteen days in warm climates and has during that period to be kept in a refrigerator, a piece of apparatus not available everywhere. The usual intradermal tests necessitate the presence of a laboratory where the solutions can be made up accurately and where they can be kept for the requisite period at a suitable temperature.

Further, the actual use of a hypodermic syringe is resented in some of the more backward portions of the globe, and the difficulty of persuading patients to come up for repeated tests is very great. Craig (1933) introduced a method which he claims to be simpler in technique than either the von Pirquet or the Mantoux test and as reliable. The instrument used consists of a short handle with five needle points at the end. A drop of undiluted O.T. is placed on the forearm and the instrument held at a right angle to the treated area and firm pressure employed until the points have penetrated the superficial layers of the skin. This method deserves to be more widely known since it has two important features to recommend it, the use of undiluted O.T. which is unaffected by tropical conditions and the employment of an instrument less feared than the intradermal syringe.

Long (1935) would have us abandon O.T. altogether since the varying potencies of brands lead to lack of accurate comparison. O'Brien (1925) testing twelve samples of veterinary tuberculins from various countries, found a great variation in the potency of the different brands, they varied on the potency scale from 200 to as low as 20 or less. Long *et al* (1935) in their consideration of this question of a standardized tuberculin describe the method of isolating the active principle of O.T. made from cultures grown on synthetic media of known chemical composition. The product so obtained can be used in solutions of accurately weighed amounts or it can be mixed with an inert, soluble substance, *e.g.*, lactose, and made into tablets, each containing such an amount that 0·1 cc. of appropriate solutions delivers the required dose. They recommend that five minutes should be allowed for dissolving the tablets.

This product is now known as P.P.D. (purified protein derivate) and as a result of its keeping properties in all conditions, its invariable potency and handy tablet form, bids well to be the preparation of choice for all tropical workers. Surveys carried out with P.P.D. have yielded satisfactory results, though Palmer *et al* (1936) performing comparative tests with P.P.D. and O.T. on 294 Negro school children, report that the former is not, in their opinion, superior in its results to O.T. at least in the case of the Negro.

Influence of leprosy on tuberculin tests.—The question has been raised as to the possibility of the presence of leprosy vitiating the results of tuberculin tests. Some workers consider that a positive reaction in a leper is to be expected, apart from the presence or otherwise of tuberculous infection. Dubois (1932) during his tour of duty in the Belgian Congo, carried out cutaneous and intradermal tuberculin tests on a large number of lepers and controls with a view to settling this point. He was convinced, as a result of these investigations, that in a leper a positive tuberculin test is evidence of a tuberculous infection.

Pathology of Tuberculosis in the Tropics.

No record of the spread of tuberculosis can be complete without a study of the pathology of the disease in various races and countries. Nor is this a field of work that can be neglected; numerous workers

have performed series of post-mortems large and small, and their findings have contributed greatly towards solving some, at least, of the epidemiological questions which confront us.

Clark (1915) analysed the records of 703 autopsies performed in the Panama Canal Zone, the majority of the subjects being Negroes from the West Indies. He recorded that as a rule tuberculosis was the cause of death and rarely a coincident disease. Evidence of old infection in the form of calcified thoracic glands, apical scars, etc., were encountered far less frequently among Negroes than Whites. Nor was there much evidence of fibrous tissue formation in the lungs of Negroes dying of tuberculosis, apart from the obliteration of pleural cavities by adhesions. Surgical tuberculosis was rarely seen in contrast with Europeans. Practically 50% of Negro cadavers showed that some of the abdominal organs were involved in the dissemination of tuberculosis throughout the body. Acute miliary tuberculosis was not infrequent, occurring in approximately 10% of tuberculosis deaths.

Borrel (1920) by his description of the pathological findings in coloured troops dying of tuberculosis in France during the war, has placed on record for all time a picture of the state of affairs that eventuates when the seeds of disease are sown on virgin soil. He laid great stress on the presence of one or more enlarged lymph nodes in the subclavicular region, "ganglions susclaviculaires." These were situated in front or behind the insertions of the sternocleidomastoid and were present in 70% of post-mortems either as a primary infection or as a spread from the infected tracheobronchial nodes. In 80% the tracheobronchial nodes were tuberculous, presenting changes of caseation and were manifestly the point from which further spread took place. The extension of the disease was due either to rupture of the node or by lymphogenous or haematogenous spread. These enlarged lymph nodes varied in size from a cobnut to a hen's egg.

Caseous pneumonia of a lobe was noted in 30%, in 20% of cases caseous pneumonia with miliary spread of tubercles in the lungs was present. Miliary tubercles were recorded as present in the lungs, spleen, liver, suprarenals and meninges in 25%, as Borrel aptly put it "it snowed tubercles." In 10% there was a pleuro-peritoneal spread by contiguity. Chronic tuberculosis formed only 5% of the total findings, caseous changes were seen in the apical regions without any involvement of the mediastinal glands, cavitation was rarely present. Abdominal tuberculosis was uncommon, while surgical tuberculosis was rarely encountered. Borrel notes that the subclavicular glands were seen twice as frequently in the Senegalese as compared with the Malagasy.

Cleland (1912) described the post-mortem findings in two Australian Aborigines, a race hitherto untouched by tuberculosis. Here massive caseation was present in the lungs with caseous changes in the mediastinal glands and tubercles scattered through the spleen, kidney and liver.

Scott (1921) in his investigation into the prevalence and types of tuberculosis in Hong Kong, found that of 300 autopsies in 72% entry was made by the respiratory tract, in 12·33% by the alimentary tract. Excluding all cases over ten years of age, the majority of the post-mortems being on Chinese children, of the 225 children, 65·77% exhibited a primary infection by way of the respiratory tract, 13·77% by alimentary. He considers it is probable that where the primary focus is located in the intestine the means of entry was by the ingestion of

Myco. tuberculosis from dried sputum in infected buildings. He noted :—

(*a*) The almost constant findings of a primary focus in the lung whenever there was involvement of the hilar nodes and the close anatomical relationship of these nodes to the primary focus. There was no evidence of a focus in the lung parenchyma despite the presence of caseous mediastinal nodes in 29 instances.

(*b*) In the great majority of cases the primary focus in the lung was single.

(*c*) Wherever a lung focus was recorded it was accompanied by affection of the root glands. It is interesting to note that Scott lays emphasis on the absence of the above condition in adults and its almost invariable presence in children. In children it was present in all but twelve cases and evident to the naked eye. In four of these, however, there was microscopical proof of infection of the lymph nodes. Tuberculosis of bones, joints or skin was rarely encountered.

Lasnet (1922) during his tour of duty with the army of the Rhine, records the presence of enormous cavities almost taking up the whole of one lobe in Senegalese who had succumbed to tuberculosis. Otherwise the pathological findings were similar to those of Borrel. In other races, Arabs, Annamites and Malagasy, the post-mortem findings were more in accord with those of Europeans, though they showed that a more acute process had been at work.

Lambert and de Castro (1925) commenting on 402 autopsies performed at a large hospital in Brazil, state that the characters of the tuberculous lesions in the Brazilians, particularly those of white stock, indicate a fairly high degree of immunity comparable with that seen in Europe and N. America. In the Negro, despite the passage of several generations in contact with other races, there was marked rarity of healed lesions and noticeable frequency of a generalized pneumonic type.

Vint (1929) recording 176 post-mortems on Africans of Kenya, ascribes the cause of death to tuberculosis in 16 (9·1%). Healed lesions were rarely met with and it was unusual to find any fibrous tissue formation around the lesions. The commonest form of the disease was miliary tuberculosis. Both lungs were filled with tubercles and in eight of the cases cavities were seen, but in only two were they larger than a bean. In some the condition closely resembled a tuberculous pneumonia. No naked eye lesions were seen, either in the brain or meninges, even when the disease was general throughout the body. All the organs in the abdominal cavity except the pancreas were found to be invaded at one time or another.

Sitsen (1928) in a report on 1,400 autopsies performed in Java, records tuberculosis as the cause of death in 292 instances.

The pathological appearances showed that the process of invasion was definitely chronic ; cavities with smooth organized walls, encapsulated caseous foci and pleural adhesions were frequently noted. Yet there was evidence of acute spread in a number of cases in the shape of widely disseminated miliary tubercles and small pneumonic foci. There was macroscopic evidence of the presence of tubercles in various organs, liver, spleen and kidneys, and the number of cases with spread throughout these organs was still further increased on microscopic examination. This was most evident in the case of hepatic spread, in 80 cases tubercles were detected in the liver and

this number was further increased by 50 when sections were prepared and examined. Sitsen states that in Malays tuberculosis of the lungs often follows a similar course to that seen in Europe but shows a greater tendency to become acute.

Ukil (1929) in post-mortem findings from Calcutta, Madras, and Patna comprising 1,529 dissections, found pleural adhesions present in a large number and these were both multiple and extensive. Enlarged bronchial nodes were present in most of the fibrocaseous types, a large proportion of hilar nodes (30·50%) showed well marked caseation and little fibrosis. The prevailing type was fibrocaseous with localization of the disease in the lobes. In these cavity formation was generally present and multiple cavities in 14%. In the majority of the cases in the age period 15–30 years, the walls of these cavities were ragged and caseous and encircled by tubercles. Over one hundred cavity walls were sectioned and well marked development of fibrous tissue noted in 10%, moderately marked in 10% and feeble or absent in the remainder. The result was that the lesions spread extensively with involvement of both lungs 62%, and miliary dissemination in 42%. Exudative changes were a much more prominent feature of phthisis than proliferative, the latter only being found in individuals over forty years of age reared in thickly populated districts. Tuberculous broncho-pneumonia with great enlargement of the hilar nodes was seen in a few adolescents, 2·3% in the age group 15–20 years. Ukil quotes Rogers' findings of meningeal spread in only 5·0% of Indian children under ten years of age as compared with 62·7% in London.

Opie (1930) in a small group of nine autopsies performed on members of the Negro race in Jamaica, noted that five adults had pulmonary tuberculosis of the childhood type, *i.e.*, located in nonapical areas with involvement of the nodes draining the areas. In one, the lesion was in the apex, but otherwise the infection was of the childhood type, in two more the pathological appearances found in the lymph nodes were intermediate between those of childhood and adult life. In only one were the characteristics of pulmonary tuberculosis as seen in the European adult encountered.

The Witwatersrand (1932) investigations included 200 autopsies and the findings were compared with series recorded in England.

i. There was a far greater involvement of the lymph nodes all over the body in the Africans.

ii. Lung lesions were less extensive as well as less constantly present in the African, while scarring, fibrosis, pleural adhesions and cavitation were less often encountered.

iii. Involvement of the spleen and liver was very much more common in the African and, in addition, tuberculous peritonitis, and infection of such abdominal organs as the suprarenals and genitals.

iv. Both laryngeal infection and meningeal lesions were less frequently recorded. This cannot be accepted as strictly accurate since these complications were not systematically sought.

Post-mortem findings in a small group of Eurafricans suggest that among coloured people the type more closely approximates to the European form of the disease than to the African type, the number of dissections performed was too small to draw definite conclusions. A terminal miliary spread was often seen when the groups of lymph nodes exhibited extensive caseation. Tuberculous lobar pneumonia was recorded in only two cases. That a certain amount of resistance

is to be found in the Africans is evident from the fact that while many cases had massive initial caseous lesions in the nodes, especially of the tracheobronchial groups, with secondary spread to the lungs or with a generalized miliary spread, yet a proportion showed extensive changes in the upper lobes with little or no change in the hilar nodes.

Pinner and Kasper (1932) in a review of 303 autopsies of coloured and 219 of white persons of all ages, from infants to sexagenarians, dying of tuberculosis, tabled the occurrence of miliary tuberculosis in 37·7% of coloured persons as compared with 15·5% of whites. Haematogenous propagation was twice as common in Negroes as in Whites except for the first decade, when the percentages were equal. Also, the Negro showed a far higher incidence of lymphatic spread in all age periods, even in the second decade, than did the White. The resistance of the Whites also in the first twenty years of life was superior to that shown by the Negro at all ages. The most characteristic features of tuberculosis in the adult Negro were :—

i. Massive lymph node caseation.

ii. Massive exudative lesions which overlapped the normal anatomical boundaries of the organs. This type of lesion was infrequently encountered, but when it did occur was almost always present in the Negroes.

iii. A type of generalized tuberculosis without the formation of miliary tuberculosis, but with irregularly scattered nodular, exudative foci. These lesions were more or less spherical, measuring up to 2 cm. in diameter and scattered widely through the different organs. The distribution was densest and the lesions largest in spleen and lymph nodes and sometimes in the lungs. The smaller foci were usually found in liver, kidneys, genitals and serous membranes.

No claim is made that the characteristic changes outlined above were solely to be seen in the Negro but they were very rarely seen in the White. The type of fibrotic pulmonary tuberculosis of the European with its huge cavities, fibrous strands and thickened pleura was seen four times as frequently in the White as in the Negro. Cavities in the Negro were frequently small, necrotic and more or less filled with liquefied masses. The authors emphasize the fact that one does meet with the chronic, fibrotic appearances in the Negro as well as caseous tuberculous lobar pneumonia in the White but the general picture obtained is the thin sprinkling of Blacks with chronic disease and the equally small number of Whites with massive exudative lesions.

Everett (1933) noted that in 402 autopsies performed tuberculosis was the cause of death in 44 coloured and 21 white persons, in two of the former tuberculous peritonitis was terminal. As far as possible roentgenograms were obtained prior to death ; these were repeated after death and then the excised lungs were inflated and X-rayed once again. By these detailed methods of examination it was possible to obtain evidence of latent lesions in the 335 in whom tuberculosis had not been the cause of death. If was found that of this group 197 Whites and 109 Coloured persons had latent tuberculous lesions in the lungs.

Analysis of the type of disease present in the tuberculous group demonstrated the fact that a considerable number of pulmonary lesions in Negro adults originated in the apical regions of the lungs and the adjacent lymph nodes were involved. Thus the course of the

disease in these victims was intermediate between the adult and the true childhood form :—

Race	Childhood Type		Adult Type	Abdominal	Latent Tuberculous Lesions	Non-Tuberculous	Total
	Extra Apical Lesions	Apical Lesions					
White ...	1	1	19	0	197	12	230
Negro ...	9	13	22	2	109	17	172

The group of 22 Negroes showing lesions of the adult type ranged from 20–49 years. In some there was more or less widespread tuberculous broncho-pneumonia ; in others, lobules or groups of lobules were the seat of the same process. There were nine cases of massive caseous pneumonia ; this was defined as massive when there was consolidation of a whole lobe or its equivalent. All the 22 cases exhibited cavities, in 14 the walls were sharply defined, organization being present since the cavity lining was smooth. In 5 others the walls were ragged and necrotic, while in the remaining 3 both stages were observed.

The group of nine Negroes with the true childhood type of the disease ranged from 17–44 years. The caseating mediastinal nodes and the affected pulmonary areas varied in size from small foci 2–3 mm. across to almost homogenous masses measuring as much as 10×5 cm. The number of nodes showing change varied from 1–21. Five of these nine cases had cavities. The group of 13 Negroes with localization primarily in the apices and caseating mediastinal nodes were from 17–45 years. Massive tuberculous pneumonia was noted in 8 ; all had cavities, five had necrotic walls and in 8 the walls were organized. The two cases of tuberculous peritonitis were female Negroes aged 23 and 25, respectively.

As a complication tuberculous peritonitis occurred in 5 of the 22 Negroes with childhood type of disease and in 1 of 22 with the adult type, none was seen in the series of 21 Whites. Acute miliary tuberculosis occurred in only 2 of the whole series and in both was associated with the childhood type of extra apical tuberculosis in Negroes. Tuberculous meningitis was seen twice, both cases being in adult Whites.

Marked fibrosis was present in 14 of the 19 cases of adult type in Whites and only in 4 of the 22 Negroes, all the Whites had cavities and in only one were the walls seen to be necrotic. Long (1934), commenting on the pathology of thoracic tuberculosis, said there were many cases which could not be classified on a strictly anatomical basis as either the adult or the childhood type of tuberculosis. Such cases have large apical or subapical cavities of the adult type and with these gross enlargement and caseation of the tracheo-bronchial lymph nodes. This condition is frequently met with in Negroes and is not uncommon in White adolescents and in Long's opinion represents a borderline case.

Wilcocks (1934) made 71 post-mortem examinations in Tanganyika and of these tuberculosis was the cause of death in 11. In 6 miliary tuberculosis was noted, in the remaining 5 little fibrotic change was

seen and the walls of the cavities were necrotic though in 1 case there was evidence that healing had taken place in one of the lesions.

Pastor and Cestero (1936) interpreting the X-ray appearances in 1,000 Porto Rican patients with pulmonary tuberculosis maintained that no significant differences could be seen in coloured patients as distinct from White. Of the total 809 were Whites, of Spanish stock, 159 Mulattos and 32 Negroes. The form of the disease was preponderantly fibrocaseous, in 48% exudative infiltration was diagnosed, in 52% fibrous changes were equal to or greater than the exudative changes. Massive tuberculous pneumonia was only recorded once, while miliary tuberculosis was seen in 5 cases. Cavities were seen in 56%, the most frequent location being in the upper third, next in the middle third and relatively rare in the bases of the lungs. Koppisch (1936) who based his findings on 628 autopsies in Porto Rico differed considerably from the above Porto Rican observers in his analysis of the observed changes. He found a number of lesions of the childhood type with wide dissemination and concluded that the Negroes of Porto Rico are less resistant to tuberculosis than the Whites.

Causal Factors in Tuberculosis in the Tropics.

Race.—The marked differences between the mortality rates of various races living in approximately the same environment and under largely similar conditions of climate, work, etc., are recorded by Cummins (1923), whose well-known table of figures relative to the different races is reproduced here :—

Annual incidence and mortality from Tuberculosis per 10,000 *of average annual strength in seven racial types of British Expeditionary Force, France and Flanders,* 1918.

	Cases per 10,000	Deaths per 10,000
British and Dominion Troops	6·056	·398
Portuguese Troops	33·636	9·242
Chinese Labour Corps	36·355	13·433
Indian Troops	93·464	17·249
Indian Native Labour Corps	142·040	53·384
South African Native Labour Corps (Kaffirs)	290·665	221·923
Cape Colony Labour Corps (Cape Boys) ...	444·115	103·627

Even in temperate climes evidence is not lacking that race may play a part in the onset of the disease. Bradbury's (1933) investigations in the towns of Jarrow and Blaydon led him to believe that there was evidence of a racial factor responsible in part for the higher incidence amongst the Irish section of the population. There are in existence two schools of thought with regard to the part played by a racial factor in the onset and spread of tuberculosis amongst tropical peoples. One holds that the widespread incidence of disease amongst Africans is due entirely to the absence of prolonged exposure to infection and is further aided by lack of hygienic surroundings. The other asserts that given centuries of exposure and a betterment of environmental conditions there still exists a racial characteristic that favours undue susceptibility to the disease. The term " racial factor " is not always employed accurately and as Guild (1933) points out, many workers using such a term are not referring to a true genotypic difference.

Rather they have in mind the result of a relatively short period of exposure to infection ; this, he states, is not a racial nor biological factor but an historical one. HOEBEKE (1934) is convinced that there is an essential racial difference, the Black makes his tuberculosis a Negro tuberculosis whatever surroundings may be envisaged. What reinforces Hoebeke in this assertion is the fact that the Negro torn away from Africa and transplanted to a strange country after a period of centuries continues to manifest this type of tuberculosis peculiar to his race. In face of this prolonged contact the Negro still remains more sensitive to the disease than the other races dwelling around him. Despite transplantation into alien surroundings over long periods of time the Negro maintains his biological characteristics as we know from SNYDER's (1929) investigations into the blood groups of the Jamaicans. In Jamaica, though crossing with whites has modified the proportion of the blood groups to some extent, the Jamaican Negro, despite generations of existence in a non-African environment shows in his blood grouping definite evidence of his African relationship.

CUMMINS (1934) says the childhood type of tuberculosis seen in the African goes with a fundamental lack of resistance to the disease. He maintains that the African appears to be racially incapable of developing against the European *Myco. tuberculosis* those fibrotic barriers which localize the disease in other races.

SCOTT (1935) does not consider that the theory of virgin soil is a complete answer to the question as to why tuberculosis is so often severe in tropical peoples. He, too, considers that the susceptibility of the African is a racial peculiarity. That other races, apart from the White, do develop a high degree of resistance is seen in HALL and CHANG's (1934) studies of latent tuberculous infection in Chinese adults. They state it appears evident that the Chinese have been exposed to infection since the days of the old Chinese civilization. To-day the disease is of the localized type with no florid excretion of bacilli. Infection is universal and immunity is maintained at a high level by repeated small infections while allergy is not unduly raised.

While we have ample illustration of the susceptibility of one race to tuberculosis, there is not lacking proof that at least one race has a markedly heightened resistance to the disease. ARNOULD (1936), who investigated the incidence of tuberculosis amongst the Jews, quotes the figures for the tuberculosis death rate among the Jewish and non-Jewish populations of Budapest from 1921–1934. In 1921 the rate for the Jews was 19·7 per 10,000, as compared with 43·4 per 10,000 for the non-Jewish sections. Since then the rate for both parties has fallen steadily, but the Jewish rate is still far lower, 10·8 as compared with 19·5 for the non-Jewish population. He describes the conditions in Poland to show that a lower rate is not due to better environment ; there the Hebrews are amongst the poorest of the people ; despite this, their death rate is low. Arnould believes that the Jews as a race have acquired a special resistance during the fifteen to twenty centuries in which they have been constantly huddled together in urban surroundings.

PUTNAM (1933) comparing the figures of 373 Italian and Hebrew families attending a tuberculosis dispensary, was convinced that the type of disease differed for the two races ; among the Italians the disease attacked the younger group and pursued a more severe and rapidly fatal course than was the case with the Jews. On the other

hand, authorities such as BOLTANSKI (1935) do not agree with HOEBEKE ; he considers tuberculosis is not a new disease of Africa and may have been present for centuries. The spread of the disease is not due to a special racial difference, but is due to circumstances parallel to those in the U.S.A., where the Negro engaged in agricultural pursuits falls a victim, not necessarily because he is an African, but because he becomes urbanized.

GALLOWAY (1928) made the observation that the heightened susceptibility of certain races domiciled in Malaya follows exposure to urban conditions after centuries of rural life. He places them in the following order as indicating their relative unprotectedness : Malays, Japanese, Agrarian Chinese and some Indian races, especially Sikhs. He crystallizes his views in a terse and significant sentence : " the nearer the land, the more recent their adoption of urban conditions, the more fatal the disease."

MILLS (1935) believes that the basic factor at play is the energy level which, in turn, is definitely dependent on the degree of climatic drive imposed on the population, especially throughout childhood, and that the racial factor is far less significant.

MOON (1928) observed that the average size of the spleen in the adult Negro is much below that of the white race.

This anatomical difference is not the sole one present : in a comparative study of the two races TURNER (1932) in the course of the Witwatersrand investigations compared the physical measurements of South African natives with that of Europeans. He found the African to be inferior in physique and this was especially noticeable in relation to chest measurements, both in size of chest and degree of normal expansion. During the last few years important work has been carried out on a physiological characteristic of certain Oriental races, low vital capacity.

KRISHNAN and VAREED (1932) estimated that in 103 medical students, 18–29 years of age, from the Madras Presidency the vital capacity was only 67% of the average for British and American men of the same height. They hold that this is not a racial characteristic but due to climate, lack of exercise and low metabolism. MASON (1932) in a similar study of the vital capacity of 853 South Indian women, found they averaged 76% of the measurements in American women. She considers this difference is characteristic of many Oriental peoples.

FOSTER and HSIEH (1923) in a small series of 75 Chinese women had obtained figures practically identical to those of MASON for South Indian women. CORDERO and OCAMPO (1931) calculated the vital capacity of 2,600 male University students in the Philippines. Their analysis showed that the average figure for male Filipinos was 2 litres per sq. metre of body surface. This, they pointed out, was equivalent to that of male Chinese but lower than that of American males of a similar class in whom the average was 2·5 litres.

Another factor to be taken into consideration is the influence of cross breeding between races. DAVENPORT and STEGGERDA (1929) carried out extensive researches into the effects of race crossing in Jamaica. They say " when two inbred varieties are crossed, the offspring show unusually rapid growth, attain exceptional size and display high resistance. Such hybrid vigour is ordinarily found in the F. 1 generation (pure White and pure Black), but it may appear in individuals of later generations of panmixia whenever the two causative genes are inbred in the same zygote."

They found no evidence of physical hybrid vigour in the Browns as contrasted with the Blacks and Whites.

The consensus of opinion is that the people of mixed race tend to exhibit clinical and pathological characteristics similar to those of Whites and do not present so markedly lowered a resistance as in the case of the pure bred Negro. HALFORD (1933) commenting on the many racial mixtures met with in Hawaii says that such admixtures do definitely influence the correlation of mortality rates and percentages of tuberculous infection. Pure Hawaiians have a tuberculosis death rate of 310 per 100,000 and a Mantoux positive figure of 75·9%. In Asiatic Hawaiians the corresponding figures are 150 per 100,000 and 70·6%, and in Caucasian Hawaiians 130 per 100,000 and 56·0%.

One should not lose sight of the fact that people of Mixed race tend to break away from the mode of living of their predecessors and this environmental change must play a part in altering their resistance. HRDLICKA (1908) describing the progress of tuberculosis amongst American Indians, noted that the mixed bloods contracted active disease less frequently than the full bloods, he considered it probable that some change in living conditions lessened the spread of infection. CARTER (1920) held that a test of mentality would show a greater difference in favour of the better developed type than any comparison between light coloured Negroes and those of pure descent. In his view the stouter resistance apparently shown by those of Mixed race over the pure African strain was due to racial and cultural development and not to inherited resistance.

Diet.

COBBETT (1930) in his investigations into the increase of tuberculosis mortality during the European war, concluded that the interference with the food supply, especially shortage of fats and consequent lack of fat soluble vitamins, played a large part. Certain animal experiments indicate that there is ground for believing that fat soluble vitamins have some effect in lessening susceptibility to tuberculous disease. SMITH and HENDRICK (1926) carried out experimental tuberculous infection of albino rats and showed that they could be rendered susceptible to tuberculin shock by withholding fat soluble vitamin A. The tubercle infected rats deteriorated more rapidly than the non-infected controls when maintained on a diet of low biological value and low in fat soluble A. A liberal allowance of vitamin A appeared to afford protection against the early deterioration. SCHÜTZE and ZILVA (1927) in their experiments on guineapigs obtained some evidence of the deleterious effect of a restricted diet on the course of tuberculous disease in the guineapig. OTERO *et al* (1934) in experiments on white rats depleted of vitamin A and inoculated with human, bovine and avian tubercle bacilli, noted, on the other hand, that there did not appear to be any lessened degree of resistance. The only positive finding was the appearance of caseation only in those rats completely depleted of vitamin A. Most tropical dietaries have a deficiency of the fat soluble vitamins and not a few are deficient in other necessaries. ALLAN (1932) was impressed with the part played by insufficient food in adding to the liability of mine labourers in South Africa to develop clinical tuberculosis. He further observed the tendency for the tuberculosis incidence and mortality to fall when good and sufficient nourishment was available. WILCOCKS (1935) remarks that the caloric value of the native diet in Tanganyika is adequate, but there appears

to be a deficiency of the fat soluble vitamins. GEOGHEGAN (1919) recorded that in the West Indies starchy foods predominate and proteins are limited.

Housing Conditions.—There is now no question that bad housing conditions have a deleterious influence in the spread of tuberculosis. Unfortunately, such conditions are frequently encountered in most tropical countries. OPIE and ISAACS (1930) picture of the housing conditions in Jamaica may be taken as typical of many other areas especially in the West Indies. They are positive that the spread of tuberculosis in Jamaica is increased by the overcrowding in the tenement rooms not only in Kingston but also in the larger towns. PASTOR *et al* (1935) made a survey of two municipal areas in Porto Rico, one was some distance from any large centre, had a cool and pleasant climate and while overcrowding per house was present did not have any marked congestion of buildings. The other, close to a large city, with a hot climate and a large number of buildings huddled together in a constricted area had a higher tuberculosis death rate. They considered that this overcrowding of buildings jammed together on small tracts of land, played a large part in increasing the opportunities for contagion.

The lack of elementary sanitary principles further increases the chances of infection. AUGUSTINE (1929) studying the home conditions in contact families injected dust collected from floors and furniture into guineapigs. Two out of nineteen homes of White, and four out of five homes of Negro, families were positive for the presence of *Myco. tuberculosis*. This danger is accentuated by the habit, so widespread in the tropics, of indiscriminate spitting; MINETT (1930) conducted an investigation over a period of four months in Hong Kong. Specimens of sputum from public places such as markets, stations and streets were examined. In 7% of these, acid fast organisms, morphologically identical with *Myco. tuberculosis*, were detected.

Syphilis.—The widespread incidence of syphilis in many tropical countries often presents a problem to the phthisiologist. Apart from the question of differential diagnosis in the rarer form of syphilis of the lung there is the difficulty of deciding how far to carry out intensive anti-syphilitic treatment in tuberculous subjects. The subject has received considerable attention in the U.S.A. especially in relation to tuberculosis work amongst Negroes. The necessity for this is shown by GUILD and NELSON (1936) who circulated a questionary to sixty-seven institutions in the United States involving twenty-five thousand patients. They ascertained that where serological tests were carried out the Wassermann reaction or its equivalent was positive in no less than 21% of Negroes as compared with 4·1% of Whites.

There are some authorities who hold that there is a definite relationship between tuberculosis and syphilis. LANDSBERGER (1923) analysed the post-mortem findings in 5,323 cases in Germany and came to the conclusion that the two diseases do not co-exist more frequently than their individual incidence might explain. On the other hand, GREER (1930), who performed serological tests on 1,994 persons attending a tuberculosis clinic concluded that some relationship did exist since the incidence of syphilis was conspicuously higher in those with tuberculosis than in those without.

Whether it is wiser to concentrate in treating tuberculosis and apply the minimum of treatment for syphilis when both diseases are present, or actively to treat the latter, is a question which deserves serious

consideration. The danger of too thorough anti-syphilitic treatment was emphasized by POTTER (1916) who considered that such treatment should be administered with care. He recommended that small doses of arsenicals should be given for a short course with heavy metals or with rest. SCHLESINGER (1926) enunciated certain guiding principles based on his own wide experience of treatment and these form a valuable aid to those who are called upon to face the problem.

i. Late syphilis clinically quiescent but complicated by recent pulmonary tuberculosis. Treatment should be concerned solely with the lung condition and anti-syphilitic treatment abandoned until definite evidence of cure, or at least marked improvement of the tubercular process obtained : even then arsenical preparations should be avoided and heavy metals employed.

ii. Untreated late syphilis in conjunction with fibroid phthisis. There is less danger of reactivation of the lung condition but only small doses of arsenicals should be given in addition to treatment by heavy metals.

iii. Fibroid phthisis and early syphilis. This depends on the degree of activity of the pulmonary disease, if there is little chance of stirring up trouble then full anti-syphilitic treatment should be undertaken. If cavities are present or any evidence of active disease small doses of arsenicals should be instituted and the thoracic condition carefully watched for a flare up of the old lesions.

iv. Early tuberculosis present with recent syphilis. The prognosis in these cases is unfavourable. Anti-syphilitic treatment takes second place.

BAUER (1934) believes that syphilis takes a modest place as one of the aggravating factors in the causation of pulmonary tuberculosis and that syphilis contracted during an active tuberculous infection does not hinder the cure of the latter. The more syphilis approaches the tertiary stage the less does he fear its effect in tuberculosis. Further, he holds that the correct therapy of syphilis nearly always diminishes the evil effects of tuberculosis.

A recent review of the whole question is furnished by PADGET and MOORE (1936), who, from their experience of the administration of a venereal diseases clinic with 20,000 patients, 70% of them being Negroes, came to the conclusion that there was a connexion between intensive anti-syphilitic treatment with full doses of arsenicals and an acute onset of tuberculosis. They observed 15 cases in whom the sequence of events was strongly suggestive of a flare up of acute tuberculosis with rapid dissemination following a course of arsenical treatment. All of them were Negroes, the majority being women, while 9 of them were under thirty years of age. They do not agree with those workers who hold that active tuberculosis favourably modifies the progress of syphilis, but they are of the opinion that untreated syphilis has a detrimental effect on the course of tuberculosis. As they point out the recent syphilitic must be rendered non-infectious as speedily as possible for the benefit of the community, and treatment has to be undertaken even in a modified form.

Further, it is folly to concentrate wholly on the cure of the lung condition neglecting completely the spirochaetal infection since the end result of untreated syphilis is, too often, death.

Malaria.—The interaction between malaria and tuberculosis has attracted the attention of a number of clinicians and opinions are still divided as to the benefits or otherwise of the co-existence of these two infections. Not only is the subject of clinical interest but it also has a distinctly historical appeal. ADAMS (1849) in a footnote to his translation of the First Book of Epidemics remarks that certain authorities,

particularly of the French School, believed Hippocrates definitely asserted that intermittent fevers superinduced an immunity to phthisis. FREIMAN (1927) while making a study of this problem in Cyprus of inter-relationship of the two diseases tuberculin tested (von Pirquet) 406 persons suffering from acute or chronic malaria. In the acute cases, numbering 136, anergy was present in 91%, hypoergy in the remaining 9%. The duration of this anergic phase varied from 7–40 days. In 272 cases with chronic malaria anergy was present in every one and lasted from 20 to 200 days. He also furnishes clinical examples illustrative of the rapid onset and spread of tuberculosis in the presence of malaria. In confirmation of his views he quotes the opinions of GRACIEUX and ATKEY who maintain, as a result of their extensive clinical and pathological observations in various tropical countries, that malaria forms a good soil for the implantation of tuberculosis and that the simultaneous presence of both diseases in the same subject increases the gravity of the prognosis.

KYRIASIDIS (1930), investigating the subject calculated the opsonic index to *Myco. tuberculosis* in 128 malarial patients and also carried out tuberculin tests (von Pirquet) on 125 adults suffering from malaria. He concluded from the results of these that malaria does not produce conditions favourable for the implantation and spread of tuberculosis. The increase in the opsonins in the serum of these cases of chronic malaria would, he opined, offer a powerful resistance to tuberculous infection. COLLARI (1932) is of the opinion that in a "malarious soil" the *Myco. tuberculosis* develops poorly and its virulence is definitely lessened. On the other hand, he observed that if malarial infection is contracted by a tuberculous subject there is a tendency to a rapid spread of the miliary type. He furnishes (1933) a detailed history of five open cases treated by malarial therapy. The results were bad, 1 dead, 3 worse, and 1 improved. JEMMA (1932) considered that malaria markedly aggravated the course of tuberculosis. In children suffering from malaria he advised a careful watch should be maintained for the onset of acute tuberculosis.

KRISHNAN (1936) records that in a fatal outbreak of spontaneous tuberculosis in laboratory monkeys 14 died, of these 4 had been infected with malaria and 10 were free from any such infection. A comparison of the tuberculous lesions in both groups showed that there was not much difference as regards the type of the disease since the majority of the animals evidenced the changes of acute miliary tuberculosis. In three of the monkeys, however, who had been inoculated with malaria there was distinct proof of fibrosis and calcification in the lungs. These monkeys had through their inoculations acquired a high degree of immunity to malarial superinfection. SCOTT (1930) states that he has never seen fibroid phthisis or healed tuberculosis in monkeys. KRISHNAN infers from this that the fibrosis and calcification may well be attributed to the influence of this acquired immunity to malaria. HODSON (1929) could not find any real association between the two diseases.

Helminthic infection.—In all cases of tropical disease anthelminthic treatment is so much a matter of routine and its benefits so clearly indicated that observations such as those of Mandoul require careful consideration.

MANDOUL (1931) reviewing his work in the early years of this century recapitulated the fact that his experiments on the guineapig indicated that a retardation of the tuberculous process occurred when

the animal had been infected with *Taenia discursis*. He quotes SOROUR's (1930) observations in Egypt where he had found marked fibrosis around, and definite encapsulation of, tuberculous lesions in the lung when bilharzia was also present in the same subject. Similarly, he considers that the rarity of genito-urinary tuberculosis in that country may be due to the existence of bilharzial lesions in the urinary tract.

SOROUR considers there is a possibility that helminths, especially schistosomes and ankylostomes, with their accompanying intense eosinophilia render the soil less favourable for the development of tuberculosis and MANDOUL agrees with this view.

VON BÜLOW's (1929) case of a young man in Costa Rica, in whose sputum were found larvae of *Ancylostoma duodenale* and scanty acid fast bacilli, points to the possiblity of the hookworm directly influencing the course of the tuberculous invasion. X-ray examination of the patient revealed opacities at both apices with some decrease of translucency in the lower portion of the right upper lobe. After treatment with oil of chenopodium the conditions cleared up entirely in the lungs. von Bülow holds that there was a re-activation of a latent tuberculous infection due to the passage of larvae through the lungs. BERNY (1936) found that ankylostomiasis and pulmonary tuberculosis were not infrequently encountered in the same subject in French Guiana.

Of 30 open cases of tuberculosis, 13 were infested with worms, in 11 of these hookworm was present. He followed the course of the disease, investigated the degree of infestation, the eosinophil count and the effect of disinfestation and concluded that tuberculosis ran a similar course in those who were parasitized as well as in those who were free.

Treatment by Collapse Therapy.

Artificial Pneumothorax.—While the usual preventive measures have been advocated in most tropical countries it is only recently that the advantages of surgical treatment have been considered as possible of application outside the temperate climes. There are still vast areas where the native population is denied the advantages of any form of collapse therapy. Such a state of affairs is due partly to the great difficulty experienced in persuading the inhabitants to undergo the long period of detention required, in part to the lack of sufficient medical officers with time enough at their disposal to carry out the necessary measures. Moreover, while there are medical administrators eager to institute modern therapeutic measures they are deterred by the fact that knowledge of the efficacy of such treatment in coloured people is, to a great extent, lacking.

On this point a certain amount of information may be culled from a study of results of collapse therapy amongst Negroes in the U.S.A. There we have at our disposal the accumulated knowledge of skilled workers who are treating a coloured population with an apparent lack of resistance to tuberculosis.

CHADWICK *et al* (1933) comment on the widespread opinion in the U.S.A. that tuberculosis is so prevalent amongst Negroes and so unresponsive to routine treatment that it is useless to do more than keep them in bed as the disease progresses in face of all efforts. This has not been their experience for between January 1931 and September 1932, 263 male and 201 female Negroes with pulmonary

tuberculosis from 5–65 years of age were hospitalized and given artificial pneumothorax treatment. There were 10% in the minimal stage, 23% moderately advanced, and 67% far advanced. Of these 58% died, 28% apparently arrested, 5% improved and 9% not improved. They believe prompt collapse therapy is indicated in the Negro since it definitely prevents spread of the disease and reduces toxaemia. They also express the view that in the Negro the lack of fibrous tissue formation results in a lessening of pleural adhesions and adhesive pleuritis as that complete collapse is more often obtained than is the case with the Whites.

Brock (1933) compared the treatment of a group of 36 Negroes, all with advanced disease, with that of a group of 161 Whites. In both groups cavities were present, in all but 3 of the Negroes and 7 of the Whites. 21 Negro patients died in the first twelve months of treatment; 8 of these deaths occurred in patients with one lung affected. Satisfactory collapse was obtained in six of these unilateral cases yet spread to the contralateral lung took place when the collapse had been maintained for some time. Only one of the 36 patients is at work, and she is a nurse, two with bilateral and seven with unilateral disease were improved. The results among the white patients were much better. His experience has been that in several so-called unilateral cases with good collapse, evidence of commencing exudative lesions in the contralateral lung soon became apparent. While Brock's experience is contrary to that of Chadwick, it is to be noted that all his cases were advanced. Those who have carried out similar measures would be very chary of recommending active intervention at an advanced stage in coloured peoples, except for the relief of symptoms.

Gaines and Keller (1933) from their limited experience of artificial pneumothorax in a small group of 7 Negroes stated that such a procedure in the Negro is fraught with peril. Complications occur with greater frequency and are more serious than in other races. However, they aver that while results in collapse therapy in the case of the Negro vary considerably they approximate sufficiently closely to those obtained in white people to justify the labour and time expended. The difficulties are enumerated, namely, the Negro's dislike of hospitals, the difficulty of obtaining regular refills due partly to aversion to the needle, partly to distance to treatment centres. Brown and Sampson (1935), consider that in the age period when exudative lesions are predominant, that is, between the ages of 12–19 years, A.P. is the treatment of choice. They also recommend that all Negroes, irrespective of age, should be placed in this group.

A problem that is continually present in connexion with A.P. treatment is the provision of an adequate number of beds. In recent years efforts have been made to limit the time spent in bed and to extend facilities for ambulatory treatment. The results of such ambulatory treatment are sufficiently satisfactory to justify its adoption wherever the question of obtaining hospital accommodation raised difficulties.

In Germany, Kogan (1930) treated 33 cases by A.P. without placing them in hospital and found the results were as good as among those who had had the benefit of sanatorium treatment. Myers and Levine (1935) found that with progressive lesions, minimal in extent, and even in those with more advanced lesions, A.P. treatment was markedly successful with only a short period of bed rest at home or at hospital during induction. Furthermore, some who refuse hospitalization will

submit to an A.P. provided they may continue their activities. Of a group of 52 white patients, mainly adults and adolescents, most of whom had had no bed rest or only a few weeks, 4 died, and 42 are working, or are fit for work.

Cutler *et al* (1934) set up a clinic in 1931 for the treatment of Negroes with A.P. They were forced, in face of a shortage of beds, to institute an ambulatory form of attention. A short period of hospitalization at the time of induction, about one week, was followed by sending the patient home. Once at home he was instructed to remain in bed between visits to the clinic for refills and gradually permitted to increase the time spent out of bed as improvement was noted. The advantages of this treatment from the administrative viewpoint were marked, a far greater turnover of patients per bed being thus obtained. Thirty-seven adult Negroes were treated and at the time of writing 16 of these were either working or improved, all had negative sputum. They consider that their results justify a much wider extension of these methods.

As far as the tropics are concerned no large series of figures for this form of treatment are available. Blanchard (1935) in French West Africa performed A.P. on 52 out of 356 tuberculous cases in a space of four years. Of these 32 had extensive lesions of the fibrocaseous type with haemoptyses. Of this series 3 were in an early stage, 7 moderately advanced and 42 advanced, 47 were unilateral and 5 bilateral.

Only once was bilateral collapse induced and that because of severe haemoptysis, in this case life was prolonged for two years. Unfortunately the immediate results were so good that 48 left hospital after a dozen or so refills, confident that they were well on the road to recovery and were not traced. Of the 4 who remained, it was impossible to give a definite prognosis but both clinical and X-ray evidence point to the probability of ultimate cure. Stones (1928) demonstrates the difficulties met with when A.P. is attempted amongst the more backward races in East Africa. He states that some were too frightened or too mystified by the idea of the treatment and that it was rare to encounter a patient in a sufficiently early stage to benefit by the procedure. Heimann (1936), who has attempted A.P. treatment among the South African natives found that after the induction and one or two refills they left precipitately and he has given up all attempts to continue with it. Cummins (1932) believes, however, that some of the natives have reached a stage where their resistance is sufficiently high to benefit from modern treatment. It might be argued, he adds, that they were unwilling to undergo sanatorium treatment but the increased number who yearly seek hospital treatment indicates the growing confidence of the natives in European methods.

Wilcocks (1932) reports promising results from A.P. treatment in Tanganyika. He maintains while it has the disadvantages of prolonged treatment it is a simple procedure which can be done on out-patients. In 1934 he again reports encouraging results from this form of treatment. Pai (1927) reviews the results of A.P. treatment of 93 patients in India. These were all moderately or far advanced, in 22% the disease was arrested as compared with 14% in 344 patients receiving routine treatment only. In 53% of A.P. cases the sputum became negative as compared with 17·7% in the ordinary group.

In the Dutch East Indies anti-tuberculosis measures are well in advance of most tropical countries, yet Paneth (1932) complains that

collapse therapy is not sufficiently practised there. He has obtained satisfactory results in members of all races domiciled there.

Phrenic Evulsion.—In the more remote areas and amongst primitive peoples averse to prolonged attendance at a hospital, phrenic evulsion must be the operation of choice. It has certain advantages, simple to perform, complications are unusual and there is no prolonged after treatment. Originally recommended as a procedure for basal lesions, its scope has been widened in more recent times and a perusal of published reports of its use in temperate and tropical areas furnishes us with an idea of its scope and its limitations. Wolf (1928) reported 18 cases operated on in France, all with cavities in the upper lobe, of these 5 were completely cured despite the fact that in them the cavities were large and had resisted treatment for over a year. They disappeared in eight to twelve months after the operation. In 9 cases, recently operated on—oldest only six months previously—a definite amelioration of symptoms was noted, sputum was less in quantity, fever subsided and the sputum became negative, while there was a partial regression of the lesions. In four cases there was no improvement, since large cavities were present, kept open by adhesions. Matz (1936), in the U.S.A., employed phrenic therapy for 233 out of 320 tuberculous patients, of these 301 were far advanced. He reports good results in overcoming symptoms including a favourable effect on haemoptysis. For the period under review, ranging from five months to six years, 63 were alive (27%); of these 35 were much improved or improved, 18 were unchanged and 10 worse. There was a diminution in size or actual disappearance of cavities in 25 of 48 patients. Gaines and Keller (1933) performed phrenicectomy in 25 cases of pulmonary tuberculosis in American Negroes, 6 were moderately and 19 far advanced. The results were encouraging, since 44% showed definite improvement.

Frimodt-Möller and Gnanamuthu (1930) record good results by phrenic exairesis as a supplement to A.P. treatment in India. Marked improvement was obtained in about half the number of cases when this procedure was followed: of 36 patients, 15 were much improved and 11 improved. In 55 cases it was the sole operation and of these 19 were much improved and 12 improved. Unfortunately the time elapsing between the operation and the publication of the results is not given. The authors point out its use in India, where it is difficult for patients to continue A.P. treatment after they leave the sanatorium owing to the paucity of centres where refills might be obtained.

O'Shaughnessy (1932) working at an out-station in the Sudan and unable to perform A.P. for lack of X-ray apparatus, performed phrenic evulsion in 53 cases. Of these only 32 were finally traced, 3 cured, 9 improved, 7 worse and 13 dead. No attempt was made to select cases as even in the worst examples symptomatic relief was the object of the operation. He considers that, on the whole, results were not encouraging as only three cures could be recorded, and he feared that even in these relapse might occur in the course of time. However, in the improved group there was evidence that some might ultimately obtain arrest of the disease. One or two of the results, he says, were exceptionally good and several cases were restored to normal health for a year or two before their final collapse. In many cases there was improvement of symptoms such as intractable cough.

Van Goor (1932), reported that he had performed hemi-paralysis of the diaphragm in 46 cases in the Dutch East Indies, 3 by alcohol

injections and the remainder by phrenic evulsion. The period under review was less than three months with respect to 16 of the operations and he excluded them from his results. Of the remaining 30, no clinical or radiological improvement was seen in 8. In 13 of the 22 improved cases the sputum became negative and the pulmonary lesions cleared up. He maintains that this is the best form of collapse therapy for general use in the Dutch East Indies.

Leo and Chang (1934) reviewing 41 cases in China, estimated that 68% benefited as far as the immediate results are concerned and that in 32% there was no effect or the results were adverse. The authors recommend that phrenic exairesis should be extensively employed in China, where the majority of the sufferers belong to the poor and ignorant class for whom the application of A.P. while advisable, is completely impracticable. They consider that the results tend to confirm the accepted view that the operation is most beneficial in lesions which are predominantly chronic, proliferative and unilateral. Their results have been quoted, despite the geographical differences, to emphasize the view that the operation can benefit those who stand in greatest need of help, namely, the poverty stricken and uneducated classes. Blanchard (1935) gives an account of 31 phrenicectomies performed in French West Africa, mostly in patients with the fibro-caseous type of disease, bilateral and with cavities. They were undertaken in those cases in whom A.P. had failed because of adhesions. Immediate results were good, after a period of *dyspnoea* the general condition improved, weight increased and sputum lessened, though clinically and radiologically the lung condition was stationary. In only three cases were physical signs and X-ray appearances sufficiently good to allow a resumption of work. Blanchard points out that in France the results of phrenic evulsion are 10–13% of cures after a long period of observation and that his own results are therefore not unfavourable.

Oleothorax.—This method of treatment has received very little attention in the tropics. Shrikhande (1934) reports 6 cases treated at the King Edward VII Sanatorium in the United Provinces. Of these, 3 are probably dead, 1 has lived for over three years, the other 2 for over one year. He considers the procedure a useful adjunct in the treatment of purulent effusions following A.P. Wisse (1934) stresses the advantages of oleothorax in a tropical community such as is met with in the Dutch East Indies where the difficulties of maintaining artificial pneumothorax treatment are manifold. He furnishes full details of his technique and notes excellent progress in two cases.

Thoracoplasty.—It is only natural to expect a paucity of records concerning this severe operation when so few results of the simple process of ordinary collapse therapy are available. Too few findings have been published to enable one to judge of the efficacy of this mode of treatment in the tropics.

Aurotherapy.—The employment of gold salts has not been extensive largely on account of the expense of the preparation. Brock (1931) in the U.S.A. treated a group of 17 Negroes and 29 Whites with gold salts. All the white patients did well but the results in the coloured group were disappointing. Some arrest of the disease was observed on physical examination and on an estimate of the general condition, but this was not verified by X-rays, for the roentgenograms showed no regression of the lesions. Roy *et al* (1933) treated, in India, a total of

42 patients by gold salts, some of them also received A.P. They report good results in early cases but little effect in others.

Benjamin (1934) reports the treatment since 1925 of 440 inmates of the Union Mission Tuberculosis Sanatorium, South India, with Sanocrysin. He encountered severe albuminuria in 3 cases, severe dermatitis in a similar number, chrysiasis in 2 and stomatitis of a severe nature in 4. He considers when sanocrysin or other gold salt preparation is combined with collapse therapy in disease of contralateral lung the progress is improved. Blanchard (1935) has also employed the drug in French West Africa but found large doses to be dangerous and recommends the trial of small doses intramuscularly or intravenously, 0·05 gm. to 0·25 gm. twice weekly for a total of 3·0 to 4·0 gm. In 57 cases, of whom 44 were in hospital and 13 ambulatory, 17 had albuminuria and 2 severe dermatitis as a result of aurotherapy.

Sodium Morrhuate.—The success with which another disease, namely leprosy, has been treated by morrhuate preparations, induced workers to consider the possibility of employing the same preparations in tuberculosis. Davies (1921), recommends its use in India and quotes one case in which marked improvement was obtained after a long course of treatment with sodium morrhuate. André and Labernadie (1933) employed the oil of *Hydnocarpus wightiana* extensively in the treatment of pulmonary tuberculosis. They consider that improvement took place but furnish insufficient evidence to justify their contention. However, the authoritative pronouncement of Crocket (1926), who used sodium morrhuate and ethyl morrhuate over long periods of time and on a large number of patients shows that their employment is not only useless but also may be harmful.

Solar therapy.—There are some workers who contend that with an abundant and constant supply of sunlight efforts should be made to take advantage of it. Pringle (1930) voices the opinion of most phthisiologists with tropical experience when he says the sun in South Africa is probably the most dangerous therapeutic remedy one can use unless it is supervised with very strict discipline. Crocket (1926) pointing out that sunlight has no immunizing effect on those who have not become tuberculized considers that exposure to the sun should never be recommended in a careless fashion but always under medical supervision. He finds it most advantageous in the fibroid type of disease.

Climate.—Rogers (1925) is the only worker who has thoroughly investigated the influence of climate in the tropics on tuberculosis. In his study of the incidence of tuberculosis in India in relation to the meteorological data, he found a high tuberculosis rate coincident with a high rainfall and humidity. The direction, steadiness and strength of the rain-bearing winds appear to be the most important factors in addition to high rain-fall and absolute humidity. It is of interest that his findings for pneumonia were diametrically opposite to those in connexion with tuberculosis. Many medical men in the tropics consider that the chances of recovery for the tuberculous patient in a warm climate are poor. While the chances of benefiting from residence in dry, cool climate may be more favourable there are other factors to be considered.

Knopf (1931) maintains there is no specific climate for tuberculosis and that if one has to choose between having a patient under special medical supervision with mental and physical rest in his home climate

or sending him even to an "ideal" climate where he would be in strange surroundings and do as he pleased, it is preferable not to advise a change.

Tuberculosis in Children in the Tropics.

The subject of pulmonary tuberculosis in children in the tropics has received scant attention. To obtain any information on this point we have to turn to the work of investigators in the U.S.A. in relation to the Negro child.

Opie (1924) came to the conclusion that the high mortality from tuberculosis in the Negro race and the prevalence of the acute forms of the disease are best explained by partial lack of immunization. This theory was widely taken up for a time but following further investigations, he and his co-workers, Hetherington *et al* (1929) revised this opinion, since the results of large scale investigations showed that Negro children were even more heavily infected than children of other races. This was verified by Aronson (1931) who tested a large number of school children in Tennessee by the intradermal method and found that a greater percentage of coloured than white children reacted positively. Drolet (1934) similarly found a greater number of positive reactors among the coloured children in New York as compared with the white races.

McPhedran and Opie (1933) watched the course of latent tuberculous infiltration of the lungs for a number of years in white and coloured children. Clinically manifest tuberculosis took longer to appear in the case of white children and in all had a favourable termination. In the Negro child such latent lesions developed more quickly into the clinically manifest disease and the outcome was much less favourable, either death ensured or the disease ran a long course. Gibson (1934) painted a very gloomy picture of the re-infected Negro child. He stated that in his experience children of the Negro race admitted to the sanatorium with an adult type of phthisis of any greater extent than minimal almost invariably failed to recover. Further, that no child with a positive sputum ever recovered, a fatal termination being inevitable. This compares unfavourably with investigations in England, where Cochrane (1935) in an analysis of 710 children aged 3–15 years, all with open pulmonary tuberculosis, found that the disease was fatal in 74 per cent. of girls and 72% of boys. Donnelly (1935) is of the opinion that first infections in coloured children are as satisfactorily overcome as in the case of white children.

Epituberculosis.—The writer's experience in England and the tropics leads him to consider that the pathological state known as epituberculosis is more common in the latter region. While holding a resident post in a hospital in England he examined some hundreds of children suffering from benign and malignant forms of pulmonary tuberculosis and did not encounter a single case in which a definite diagnosis of epituberculosis could be made. On the other hand in the tropics in only a small group of children, three typical cases were seen.

Epituberculosis was first described as a clinical entity by Eliasberg and Neuland (1920). They noted that in young children reacting positively to the tuberculin test certain of them exhibited a clinical picture with distinct characteristics. On examination of the chest an impaired percussion note was present, usually in the upper part of one or other lung, generally the right. On auscultation a diminution of breath sounds or definite tubular breathing was detected; rarely there

were a few superadded adventitious sounds. The onset was subacute, the child's general condition was either very slightly or not at all impaired. Some cough was usually present, but this did not form a prominent symptom. The striking aspect of these cases was the healthy condition of the children despite the presence of extensive and prominent physical findings. On radiographic examination a heavy, homogeneous shadow was detected filling the whole or part of the upper lobe, usually the limits of this opacity were sharply marked off from the rest of the lung shadow. The condition remained stationary for a period varying from weeks to months and then gradually disappeared with lessening of the physical signs and progressive diminution of the shadow on serial film examination. A differential diagnosis between it and tuberculous pneumonia is arrived at by lack of an acute onset, no marked pyrexia and the absence of the swiftly fatal termination characteristic of the latter type. From chronic non-tuberculous pneumonia it is differentiated by the absence of a history of measles, influenza or other respiratory ailment : further, there are no signs of the severe constitutional disturbances and localization of physical changes of a fibroid nature at the bases of the lungs.

The benign nature of the disease, fortunately, renders post-mortems unusual, but Epstein (1922) reported one such autopsy. Here a large caseous primary focus was seen in the upper part of an upper lobe, it was encircled by a number of tiny tubercles. The remainder of the lobe was atelectatic. Goldberg and Gasul (1930) reported the occurrence of this condition in ten children aged 2–9 years in a follow-up of 500 tuberculosis contacts and their controls. Of these 10 cases, 7 were in coloured and 3 in white children ; 3 of them had been in contact with open cases of tuberculosis, 7 had no such history. They were all positive to tuberculin tests and in all the general condition was good, the only constitutional disturbance was a slight degree of fever observed in some of them. There was the usual involvement of one lobe, most often the right upper, physical and radiological signs cleared up gradually, leaving in some no trace, in others areas of calcification.

Spence (1932) furnished an account of three cases of infants exhibiting the characteristic physical and radiological appearances. Two had a history of contact, the third had a doubtful history, a sibling having died from meningitis which may possibly have been tuberculous. In each case a favourable course was run with little disturbance of the general condition, apart from some pallor and loss of weight in the early stages. The point of interest in these cases was the performance of an exploratory thoracic puncture in one instance and the withdrawal of a small amount of caseous material. This, on examination, proved both microscopically and by animal experiment to contain *Myco. tuberculosis.*

Reichle (1933) argues that information concerning the histological appearance of resolving tuberculosis in childhood is scanty. He states that there is little doubt that a certain number of so-called epituberculosis cases are simply tuberculous pneumonia. In some, atelectasis has occurred, but the majority are directly the outcome of infection by *Myco. tuberculosis, i.e.,* retrogressive tuberculous pneumonia. This applies especially to the cases that remain for a considerable time in a stationary phase before resolution. He maintains since resolution is possible in almost any form of tuberculous inflammation, that it is

superfluous to designate any unusual forms of change by a special term.

Morlock and Pinchin's (1933) account of a case of epituberculosis in a boy of fourteen years of age added considerably to our knowledge of the pathological condition underlying some, at least, of these cases. Roentgenologically the picture was typical of epituberculosis. On bronchoscopic examination a tumour was observed pressing upon the lumen of the upper bronchus of the superior right lobe and a section of this on histological examination showed the presence of lymphatic tissue. Four days later another skiagram showed resolution of the shadow and re-expansion of the lung. They considered epituberculosis was not a pathological entity but merely due to pressure and resultant atelectasis owing to enlargement of root glands obstructing a bronchus. Prosoroff (1929) examining the radiological appearances of epituberculosis and comparing them with those seen in atelectasis in adults due to thoracic tumours, found a very marked resemblance existed between both those conditions. Parsons (1934) states that not until the tissues have been rendered allergic does epituberculosis occur. His experience would lead him to consider epituberculosis as a benign form of tuberculosis and not a specific allergic reaction.

In a comprehensive view of the literature, de Bruin (1936) defines epituberculosis as a clinical hypothesis used to explain the existence of extensive tuberculous changes which cause no permanent damage in contradistinction to the hitherto accepted bad prognosis of extensive tuberculosis in children. He considers that in many cases the root cause of the changes is the collapse of portion of the lung due to obstruction of a large bronchus. He gives examples of skiagrams in children showing—

(*a*) the similarity in appearance between epituberculosis and atelectasis ;

(*b*) displacement of the heart towards the involved side ;

(*c*) displacement of heart following an increase in the physical signs and *X*-ray appearance ;

(*d*) the decrease of physical signs and *X*-ray shadow and simultaneous return of the heart to the normal position.

An account of a post-mortem is furnished in the case of an infant of three months where the shadow appeared and disappeared only to recur again when the disease was activated by chicken-pox. Death ultimately took place from tuberculous meningitis and at autopsy it was seen that a primary focus had invaded the main bronchus with obstruction and collapse of the corresponding area of the lung. He believes that it is possible to have, in addition to atelectatic changes, definite tuberculous infiltration. He furnishes three pathological explanations of the changes seen :—

i. Atelectasis.
ii. Infiltration of specific tuberculous tissue.
iii. Perifocal reaction around a tuberculous focus.

Non-Pulmonary Tuberculosis.

It is now well recognized that surgical tuberculosis does occur outside the temperate zones though to a very much lesser extent. Wieberdink (1920), studying the question in Batavia, gathered data from the city hospital of 42 cases amongst natives of surgical tuberculosis, of these 16 were glandular. Even in remote areas it is not

unknown, as instanced by FERGUSON's (1927) statement that during his travels through the bush in West Africa he frequently observed Africans with tuberculosis of the spine. SMITH (1930) comments on the occasional occurrence of facial tuberculosis in Nigeria and quotes illustrative cases. RABELLO (1932) has rarely seen cutaneous tuberculosis in the equatorial regions of South America, but remarks that it occurs more frequently as one goes south. The lessened incidence of surgical tuberculosis appears to be due to climatic factors, quite apart from the rarity of bovine tuberculosis in many tropical and subtropical countries.

GEAR (1935) in a survey of hospital patients listed the lower incidence of non-respiratory tuberculosis in South China as compared with North China. MONTEL (1924) remarked on the rarity of joint and skin tuberculosis in Cochin China but found the Annamites just as liable as Europeans to contract extra pulmonary tuberculosis when they went to the colder climate of Europe. The only case of lupus he encountered in the eighteen years' practice in Cochin China was in an Annamite who had just returned from a three years' stay in France. He considers that the increased amount of sunlight plays a part.

Bovine Tuberculosis.

The view hitherto widely held that bovine tuberculosis is unknown in the tropics is rapidly undergoing modification. From many areas publications on the question have shown that while the disease is uncommon, it is by no means non-existent and is becoming a problem in a few countries. A number of experiments and observations carried out on indigenous cattle, show that these have a certain resistance to *Myco. tuberculosis*; this is particularly the case with the Zebu cattle, which are to be found in many parts of the tropics. LISTON and SOPARKAR (1917), in the course of their experiments inoculated Indian calves, buffalo and cow, with 50 mgm. of a culture of bovine *Myco. tuberculosis*. At least 50% of the calves lived for many days, and when killed, showed tuberculous lesions that were either healed or definitely retrogressing. They held that it confirmed the general experience that Indian cattle are less commonly affected by tuberculosis. Further, the result lends support to the opinion that the rare appearance of the disease among cattle in India may be ascribed to a natural resistance rather than to any difference in the methods of tending or housing cattle as compared with similar procedures in Great Britain. In certain regions, however, bovine tuberculosis has spread widely, as is shown by LEGENDRE's (1922) account of the disease in Madagascar. The infection was formerly confined to the southern portion of the island but during recent years has extended northwards. He complains that veterinary prophylaxis against tuberculosis in the tropics is even more neglected than human prophylaxis. PAWAN (1927) in Trinidad tested 75 head of cattle, type not stated, by the ophthalmic tuberculin test and found that as many as 13·3% were positive and post-mortem examination confirmed the presence of tuberculosis. He has never found the bovine type of bacillus in any human case in Trinidad. MANLEY (1929) draws attention to the danger of indigenous cattle being infected by the importation of tainted animals from other countries. On a stock farm in the Cameroons he found practically 50% reactors in one herd, nearly all cross-bred cattle which were kept under extremely good hygienic conditions.

He traced the source of the infection back several years to pure-bred cattle imported from Germany. He asserts that bovine tuberculosis can infect cattle in the tropics to a severe degree even when kept in an hygienic manner, and that no animals should be imported into the tropics unless they have previously passed a rigorous test. PURCHASE (1929) came across a similar state of affairs when tuberculin testing a herd in N. Rhodesia composed chiefly of local cattle crossed with Hereford and Shorthorn bulls, of 222 beasts, 45 (10%) were positive. He suggests that native cattle are more susceptible to the relatively newly introduced disease. HALL (1931) reports the occurrence of tuberculosis in a native ox in Nigeria, none had hitherto been reported in the indigenous cattle. The results of the guineapig and rabbit inoculations and the type of lesions produced pointed to the organism being of the bovine type. HORNBY (1934) from his experience affirms that tuberculosis is an unimportant cause of death in cattle in Central Africa. However, he quotes CURASSON's opinion that in French West Africa bovine tuberculosis occurred more frequently than had been suspected hitherto. He also is of the opinion that the native races of cattle, and particularly the Zebu strain, are more resistant to infection than European cattle. He maintains that the fact of such cattle being largely kept out in the open air is one of the deciding factors in this freedom from infection. CORNELL (1934) gives an interesting account of the manner in which the people of the Wachagga tribe in Tanganyika tend their cattle, also of the Zebu strain. These beasts throughout their life are kept in the huts of their owners, tied by the neck to a stall and fed with hand-cut fodder. The huts shelter both humans and cattle under the same roof and there is no partition between the animals and their owners. He tested 156 animals kept in huts belonging to native families of which one member had been found to be suffering from open tuberculosis. These cattle were tested by the double intradermal test and only two (1·5%) reacted positively. So far SOPARKAR (1929) has been the only observer to record in India a case of tuberculosis in a human being in which the causative organism was of the bovine type. The material from which the *Myco. tuberculosis* was isolated consisted of caseating cervical glands; unfortunately no clinical history was available. The possibility that the bovine strain of *Myco. tuberculosis* plays a part in tuberculosis of the respiratory tract in the tropics has, hitherto, been considered unlikely. The information recently available from Uganda (1935) that at the Veterinary Laboratory, Entebbe, 141 strains of *Myco. tuberculosis* were typed from cases of phthisis and in 4 of these (3 adults and 1 child) the bovine strain of bacilli was found, will cause a revision of opinion on the non-importance of other than human strains.

MALARIA.

CHRISTOPHERS (S. R.), SINTON (J. A.) & COVELL (G.). **How to do a Malaria Survey.** Third Edition. Revised by J. A. SINTON.—*Health Bull. No. 14. Malaria Bureau No. 6.* pp. viii+206. With 11 plates & 3 text figs. 1936. Delhi: Manager of Publications. [Rs. 1–8 or 2*s.* 6*d.*]

The first two editions of this practical manual [reviewed in this *Bulletin*, 1929, Vol. 26, p. 360; 1934, Vol. 31, p. 517] are well known to a large number of malaria research workers and the appearance of a third edition, in which a number of new facts have been incorporated, is assured of the welcome it merits. Like its precedessors it is designed especially for the use of students in malariology in India. An appendix of 14 pages supplies useful information regarding the registration and compilation of vital statistics in the different provinces of British India, information not readily accessible elsewhere. Another appendix gives a list of 52 Indian Anopheles, noting the distribution, the breeding places, and the importance with regard to malaria, of each. But the greater part of the manual is of much more than local interest and importance, and students in all countries will find it of value as a guide to the elucidation of their malaria problems.

The number of factors that determine, or that may influence, the prevalence of malaria in any locality, is very large,and their interplay may be exceedingly complex. Recent additions to knowledge have thrown light on many epidemiological problems of malaria hitherto obscure, but they have complicated, rather than simplified, the carrying out of a complete malaria survey. That the authors of this manual have been able within 200 pages to condense, not only a consideration of all the more important factors influencing malaria prevalence, but also very concise instruction as to how their relative importance may be estimated, in any given locality, is a great achievement. Detailed instructions and information in all sections, are given with a clarity and absence of ambiguity that are praiseworthy. All technique and methods of investigation recommended have stood the test of prolonged practical experience in this special field of research. As a text-book for students attending practical malariology classes it can be highly commended. *Norman White.*

COVELL (G.). **A Note on the Method used to combat Rural Malaria in India.**—*League of Nations. Health Organisation. Intergovernmental Conference of Far-Eastern Countries on Rural Hygiene. Preparatory Papers relating to British India.* Ser. L.o.N.P. 1937. III. 6. pp. 70–81.

This volume is of very considerable interest and importance for it contains, within its 414 pages, all available information concerning the organization for the protection of the public health and for the medical relief of the rural population of all the provinces of British India and of three Indian States as well. This information is not readily accessible elsewhere. The chapter dealing with malaria control in rural areas, which is under consideration here, is not a record of progress. The author starts with the assertion that no satisfactory general method of bringing malaria under rapid and effective control in rural

areas, at a cost within the means of the people, has been evolved in any malarious country in the world. India is no exception. Future efforts will be directed towards a search for cheap, naturalistic, automatic methods of mosquito control, such as "herbage cover" or "sluicing." In the meantime, the efforts of nearly all provincal health departments are concentrated on popularizing the use of cinchona preparations by persistent propaganda and on making supplies of anti-malarial drugs available to those in need of them. Quinine treatments are sold in post-offices and elsewhere below cost price in many provinces and large quantities are distributed free in certain areas. Attempts at more radical control of malaria have been made from time to time in demonstration areas but these can hardly be said to have had any effect on the health of India's rural population as a whole. Eighty-nine per cent. of India's vast population is rural.

N. W.

WHITE (R. Senior). **The *Anopheles sundaicus* Invasion of Lower Bengal.**—*Indian Med. Gaz.* 1937. May. Vol. 72. No. 5. pp. 307–312. With 1 map.

Bengal is at the extreme north-west corner of the area of distribution of *A. sundaicus*. The story told in this paper of its invasion of Lower Bengal is of unusual interest and of public health importance. As the author remarks: "It is seldom that science has an opportunity of studying an extension of its geographical range by any animal." *A. sundaicus* has long been known to occur in the Sunderbans; in 1930 it was found to be responsible for a severe outbreak of malaria at Budge Budge, sixteen miles below Calcutta on the Hooghly. Since then its range has extended considerably. The number of breeding places actually within Calcutta Corporation limits was only three in March 1934. A year later the number had increased to 36. A severe outbreak of malaria was caused by *sundaicus* in the autumn of 1936 in eastern Calcutta. *A. sundaicus* is a good traveller; it has been frequently found in trains but displays a preference for boat travel. Boats have been chiefly responsible for this extension of its geographical distribution. As it has advanced the species has shown an increasing adaptability to breeding places of lower and lower salinity. Practically all the standing waters round Calcutta are potential breeding places. The death of the Bidyadhari River by silting, caused by bunds for fish culture and for reclamation for rice cultivation and by Calcutta's sewage outfall, has been, in the opinion of the author, an important factor in making a large part of the area suitable for *A. sundaicus*. If this be so, *sundaicus* malaria here is another example of "man-made malaria." This, however, does not apply to the whole of the *sundaicus* invaded area. Another factor of importance in causing the extension was thought by COVELL to be the extensive clearance of mangrove in the Sunderbans, in the years prior to 1930, leading to increased breeding of *sundaicus* in the original focus. The author considers that only a comprehensive irrigation and land reclamation scheme holds out any hope of eradicating or even controlling breeding. He recommends the creation of a Commission of all departments of Government concerned, public health, irrigation, agriculture and lands, to formulate a concerted scheme. *N. W.*

Pistoni (Ferruccio). Contributo allo studio dell' immunità per la malaria dell'indigeno Eritreo abitante in località notoriamente malariche. [**Study of Malaria Immunity in a Native Population of Notoriously Malarial Districts of Eritrea.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1937. Mar. Vol. 18. No. 3. pp. 138–146. [10 refs.]

The observations recorded were made in two notoriously malarial places in Eritrea, Ghinda and Mansura. Parasite indexes of the adult population were lower than those of children and the number of parasites fewer; this is evidence of an acquired immunity. The immunity to *vivax* infections is more durable than the immunity to *falciparum* infections, which never attains the stage of absolute immunity. Children from one to three years of age harbour larger numbers of schizonts of *vivax* than of *falciparum*. In these areas *vivax* malaria is a disease of early infancy. *N. W.*

Guidetti (Carlo). Progetto di bonifica antimalarica per il territorio del Basso Giuba. [**Antimalaria Measures in the Lower Giuba Territory.**]—*Riforma Med.* 1937. Apr. 3. Vol. 53. No. 14. pp. 497–498, 501. [16 refs.]

In continuation of an article which appeared last year in *La Riforma Medica* [see this *Bulletin*, 1937, Vol. 34, p. 378] the author describes the nature of the country in the Lower Giuba, in so far as this has a bearing on its malaria problems, and discusses the measures that should be taken to control the prevalence of that disease. *N. W.*

Serra (G.). A propos de 15 nouvelles observations d'Européens atteints de malaria et traités par l'association quinine-paludex. [**Fifteen Cases of Malaria among Europeans treated with Quinine-Paludex.**]—*Ann. Soc. Belge de Méd. Trop.* 1937. Mar. 31. Vol. 17. No. 1. pp. 39–49.

Clinical details are given of fifteen cases of malaria among Europeans, all of whom were treated with paludex associated with quinine. The results were good. Schizonts and gametes of *falciparum* disappear from the peripheral blood in from four to six days; fall of temperature and improvement of the patient's condition precede the disappearance of parasites. The daily dose of quinine recommended approximates one cgm. per kilo of body weight; the dose of quinimax one and a half to two cgm. per kilo. The smaller dose of quinimax is sufficient for fully-grown adults; the larger dose is recommended for young people. Quinimax and quinine in moderate doses are said by the author to be more effective and more rapid in action than massive doses of either drug given alone. *N. W.*

Maselli (D.). Sulla cura della malaria nella emoglobinuria da chinino. [**Treatment of Malaria associated with Quinine Haemoglobinuria.**]—*Policlinico.* Sez. Prat. 1937. Apr. 12. Vol. 44. No. 15. pp. 704, 707–8, 711–12, 715–16.

The author records two cases of haemoglobinuria associated with malaria and the administration of quinine. One case was successfully treated with quinine; in the second case the administration of quinine

was followed by a return of the haemoglobinuria which was more severe than the primary attack. This patient made a complete recovery when treated with atebrin. A fairly lengthy review of the Italian literature of the subject is contained in the paper. *N. W.*

DECHERD (George M.), Jr. **A Fatality after Atebrin-Plasmochin Treatment of Malaria.**—*Jl. Trop. Med. & Hyg.* 1937. Apr. 15. Vol. 40. No. 8. pp. 90–91. [14 refs.]

A man aged 28, a painter by trade, suffering from malaria, *Pl. vivax*, was treated with atebrin 0·1 gm. and plasmochin 0·01 gm., three times a day. Seven doses were given in all. The treatment was stopped and quinine substituted because the patient developed icterus and tenderness of the liver. He died six days after the commencement of treatment with the symptoms of acute toxic hepatitis. No post-mortem examination was made. *N. W.*

DE (R. K.). **Treatment of Malaria in Children with Atebrin-Musonate.**—*Indian Med. Gaz.* 1937. May. Vol. 72. No. 5. pp. 290–292.

Difficulties attendant upon the administration of quinine by mouth to 40 or 50 small children a day, at the height of the malaria season, in a tea-garden dispensary, induced the author of this paper to seek a simpler method of treatment. He experimented with atebrin musonate. Two injections were given, on successive days, to each of fifty children suffering from malaria. All the children were between six months and six years of age. The dose was 0·1 gm. of "injectable atebrin," dissolved in 3 cc. of distilled water; the injection was made into the buttock. The treatment controlled the clinical symptoms and freed the peripheral blood of asexual forms of parasites; it neither destroyed crescents nor prevented the formation of them. There was no local inflammatory reaction in any case but convulsions were noted after treatment in 5 cases and restlessness and vomiting in one. *N. W.*

SORGE (Giuseppe). Il metodo di Maurizio Ascoli nella cura della malaria acuta. [**Ascoli's Method in the Treatment of Acute Malaria.**]—*Riv. di Malariologia.* Sez. I. 1937. Vol. 16. No. 1. pp. 14–30. With 12 charts. [13 refs.] German summary.

This is a record of the treatment of twelve cases of acute malaria, four *vivax*, eight *falciparum*, by the intravenous injection of adrenalin, according to the method recommended by Ascoli. The conclusions are reached that adrenalin so administered has an indirect action on the parasites and reduces the temperature; that this action is more rapid and more marked in *falciparum* infections than in *vivax* infections, and that adrenalin makes all forms of malaria infection more amenable to quinine treatment. The dose of quinine and the duration of treatment can both be reduced. Adrenalin is of value even in pernicious attacks. Its use diminishes the chances of relapse. *N. W.*

FORTUNA (Sebastiano). Un triennio di esperienze sulla cura di Maurizio Ascoli della malaria.—*Riforma Med.* 1937. June 5. Vol. 53. No. 23. pp. 825–6, 829. [27 refs.]

RADVAN (I.) & ALEXANDRESCU (D.). Essai de thérapeutique des splénomégalies paludéennes par l'acaprine. Réduction rapide des splénomégalies palustres par l'injection d'acaprine. [**Treatment of Malarial Enlargement of the Spleen with Acaprine.**]—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 362–366.

This is a record of the treatment of ten cases of malarial enlargement of the spleen, mostly chronic cases, with Acaprine. Acaprine is used in the treatment of piroplasmosis in domestic animals, for which it is a specific, but it has not hitherto been used in human medicine. The authors begin their treatment with atebrin for three days and then plasmoquine for three days, both drugs being given intramuscularly. This treatment, though causing disappearance of parasites and abolition of fever, has commonly but little if any effect on the size of the spleen. If the preliminary treatment be followed, after an interval, by an intramuscular injection of acaprine very rapid reduction in the size of the spleen takes place. The dose of acaprine given is not stated in each case; it is apparently 1·5 cc. of a 5 per cent. solution. In the vast majority of cases only one dose is required. The injection of the drug commonly gives rise to a series of symptoms which last, however, but thirty to sixty minutes; slight shivering followed sometimes by a rise of temperature, salivation which may be copious, polyuria and the passage of liquid motions are the symptoms noted. The authors consider them as in no way serious. *N. W.*

RAGIOT (Ch.) & MOREAU (P.). Essais thérapeutiques d'une nouvelle formule à base d'alcaloides totaux du quinquina. [**Therapeutic Trial of a New Preparation containing Cinchona Alkaloids.**]—*Rev. Méd. et Hyg. Trop.* 1937. Mar.–Apr. Vol. 29. No. 2. pp. 85–93.

A preparation containing the chlorohydrates of quinine, quinidine, cinchonine and cinchonidine combined with resorcin and sodium chloride, which is manufactured under the proprietary name of Quinimax, was used in the treatment of a number of cases of malaria in Cochin China. Ampoules for intramuscular injection and tablets for oral administration were both used. Given in doses which had been found by SICAULT in Morocco to be effective the curative action was almost negligible. In increased doses, however, good results were obtained in cases of *vivax*, *falciparum* and *malariae* infections. In the four cases of apparent parasitological cure reported the total amount of chlorohydrate of quinine contained in the amounts of the preparation administered varied between 3·432 gm. and 5·316 gm. The preparation appears to be active, very well tolerated, easily handled and productive of no painful reaction when injected intramuscularly. Its febrifuge and tonic actions are well marked. [See also REYNTJENS; VAN NITSEN, this *Bulletin*, 1937, Vol. 34, p. 597.] *N. W.*

VAN DER WIELEN (Y.). Prontosil en malaria quartana.—*Nederl. Tijdschr. v. Geneesk.* 1937. June 19. Vol. 81. No. 25. pp. 2905–2906. English summary (6 lines).

Sergent (Edmond). Les principes directeurs de la prophylaxie médicamenteuse collective du paludisme. [**Guiding Principles of Mass Drug Malaria Prophylaxis.**]—*Arch. Inst. Pasteur d'Algérie.* 1937. Mar. Vol. 15. No. 1. pp. 1–7.

The first essential quality of a drug used for mass treatment is harmlessness ; the second is cheapness. These must be secured even at the sacrifice of efficiency. The more toxic preparations may be used by a physician in the treatment of a case, even if the margin of safety be small, but their use is not justifiable for mass treatment. It is desirable that the drug used should act on both schizonts and gametes ; the schizontocidal action is the more important. No drug yet produced is capable of procuring the *therapia sterilisans magna*. Mass treatment must perforce be contented if it can procure a non-sterilizing clinical prophylaxis. It is possible to keep imported labour or expeditionary forces in a state of latent infection thus enabling them to become acclimatized without risk and to preserve their efficiency during the process. Among a native population the object is to prevent recrudescences and relapses in those already infected and the effects of primary infections in those hitherto free from infection. As no drug sterilizes the victim of malaria its administration does not interfere with the production of a state of premunition. Mass medical prophylaxis should be continued throughout the transmission season and the drug used should be administered daily. Emphasis is laid on the necessity of adequate control of all mass distribution of drugs and of the systematic verification of the results achieved. *N. W.*

Schäfer (Hans). Ueber Malaria Chinin-Plasmochinprophylaxe in Sumatra. [**Quinine-Plasmoquine Prophylaxis of Malaria in Sumatra.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. June. Vol. 41. No. 6. pp. 459–461.

The author found that an eight-day prophylactic treatment with 0·6 gm. quinine sulphate and twenty mgm. plasmoquine of 1,253 Javanese, who had immigrated to Sumatra, reduced the malarial incidence from 30 to 0·8 per cent. The observations were carried out over four years. The cost was slight compared with the gain in working efficiency. He found the benign tertian more refractory to treatment than the malignant tertian infection. Of great importance for the success of the method is the commencement of the treatment from the first day, that is to say, the drug must be circulating in the blood before the parasites are transmitted. *E. D. W. Greig.*

Farinaud (M.) & Moreau (P.). La prophylaxie du paludisme par médicaments synthétiques en Indo-chine. Expériences en zone hyperendémique. [**Malaria Prophylaxis with Synthetic Drugs in a Hyperendemic Region.**]—*Bull. Soc. Path. Exot.* 1937. Apr. 14. Vol. 30. No. 4. pp. 298–305. With 1 graph.

This is an account of the measures taken to protect the health and preserve the efficiency of the personnel of certain " penetration " posts, near the junction of the frontiers of Cambodia, Cochin-China and Annam, on high plateaus separating the watersheds of the Mekong and the rivers flowing to the Annam coast. This region is intensely malarious ; in 1935 the morbidity was very severe, the mortality considerable and work was much hampered. In 1936 conditions were

much improved. The administration of synthetic drugs was chiefly responsible for this improvement. All the occupants of two posts received first of all a curative treatment consisting of quinacrine, 0·30 gm. a day for five days, followed by praequine, 0·02 gm. a day for five days. This was followed in one post by the administration of quinacrine 0·30 gm. once a week; in the other post quinacrine 0·20 gm. and praequine 0·02 gm. were given twice a week. There was no sign of drug intolerance and the results were much superior to those obtained by the use of quinine in like circumstances. The authors stress the importance of antimosquito measures being also carried out. *N. W.*

Berny (P.) & Le Minor (L.). Note sur la prophylaxie médicamenteuse collective du paludisme par la prémaline. [**The Prophylaxis of Malaria with Premaline.**]—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 367–368.

Premaline is a new synthetic product which is similar in action to a combination of quinacrine and rhodoquine; it acts on both schizonts and gametes. Saut-Vata in French Guiana is an intensely malarious post; fifty men are stationed there. November to March is the most malarious time of the year. In the beginning of September 1936 the parasite index was 29·6 per cent. From 7th September to 15th December three tablets of premaline were given once a week; thereafter, till the 1st March, three tablets were given twice a month. No other antimalarial measures were used. The health of the post was excellent; there was no fever. Fifteen days after the beginning of the treatment the parasite index had fallen to zero and remained so till the end of February. In a neighbouring post, which was used as a control, malaria was as intense as usual, fatal cases occurring. *N. W.*

Taussig (Albert E.) & Orgel (M. Norman). **The Kahn Test in Malaria.**—*Jl. Lab. & Clin. Med.* 1937. Mar. Vol. 22. No. 6. pp. 614–618. [21 refs.]

This paper contains a discussion of the discordant results reported by different observers concerning the occurrence of positive Wassermann and Kahn reactions in malaria. The authors' own observations show that positive Kahn reactions are not infrequent in malaria infections even when all possibility of syphilitic infection can be excluded. In 154 cases of malaria free from the suspicion of syphilis, treated in St. Louis, the percentage of positive Kahn reactions was 21. The percentage of positive Kahn reactions in the general population was 5·5 and in the medical wards of the Jewish Hospital, St. Louis, 4·6. *N. W.*

Sergent (Edmond). Immunité ou prémunition dans les maladies à hémocytozoaires (paludismes, piroplasmoses). [**Immunity or Premunition in Haemocytozoal Diseases, Malaria and Piroplasmosis.**]—*Arch. Inst. Pasteur d'Algérie.* 1936. Dec. Vol. 14. No. 4. pp. 413–417.

This paper contains a concise and clear description of the phenomenon of premunition which is characteristic of malaria and piroplasma infections. As long as the infecting parasite remains latent in the body

so long will the body resist reinoculation with the same species. This resistance ceases when the latent infection is eliminated. The possibility of a true immunity replacing this state of premunition cannot be excluded in these diseases, but it has not yet been demonstrated.

N. W.

SERGENT (Edmond). Definizione dell'immunità e della premunizione nelle malattie infettive. [**Definition of Immunity and Premunition in Infectious Disease.**]—*Riv. di Parassit.* Rome. 1937. Apr. Vol. 1. No. 2. pp. 99–105. With 4 figs. [23 refs.] English summary.

This is an admirable exposition of premunition as contrasted with immunity. It covers much the same ground as the author's contribution above. *N. W.*

MASCARÓ GARCIA (Daniel F.). Mecanismo del acceso palúdico. [**Mechanism of the Malarial Paroxysm.**]—*Cronica Méd.* Lima. 1936. Dec. Vol. 53. No. 882. pp. 421–432.

The author has carried out a study of the conditions of the blood of animals—rabbits and dogs—under normal conditions and during histamine shock, recording the numbers of erythrocytes and leucocytes and the differential percentages of the latter in the peripheral blood before administration of histamine and in both peripheral and visceral blood during histamine shock. The results are compared with similar records in three stages of five patients with malaria paroxysms. In these he examined also the calcium and phosphorus, the blood pressure and coagulation time. He concludes :—

1. The corpuscle changes due to the parasites determine the clinical manifestations.
2. As the result of abnormal corpuscular metabolism, especially as regards the haemoglobin, toxic substances are produced and are discharged into the plasma when the merozoites are liberated.
3. These proteotoxic substances by an allergic process give rise to the malarial attack, which may thus be regarded as due to proteotoxic shock.
4. In producing the symptoms, histamine by its action on the sympathetic or parasympathetic plays an important part.
5. The body, especially by the reticulo-endothelial system, by exercise of its " antixenic " function [*i.e.*, reaction to the presence of foreign substances] brings about a return to normal. *H. H. S.*

SHUTE (P. G.). **A Technique for the Inoculation of Known Numbers of Sporozoites as an Aid to Malaria Research.**—*Ann. Trop. Med. & Parasit.* 1937. Apr. 8. Vol. 31. No. 1. pp. 85–87.

A method whereby dissected salivary glands of mosquitoes were used for infecting patients with malaria was described by JAMES, NICOL and Shute in 1927 (see this *Bulletin*, 1928, Vol. 25, p. 573). A further refinement of this method is described by Shute. The glands are dissected in a drop of sterile Locke's fluid on a sterile glass slide and are crushed beneath a sterile cover-slip of which one edge is left protruding over the side of the slide. The cover slip is raised and washed several times with drops of Locke's fluid, the washings being added to the original fluid collected in the middle of the slide. The fluid on

the slide is drawn up in a hypodermic syringe and by adding further drops of fluid to the slide the whole is diluted to exactly 1 cc. The contents of the syringe are then thoroughly mixed. From this suspension 0·01 cc. is measured in a capillary pipette, spread on as small an area of a slide as possible, dried and stained. The total sporozoites can be counted using an Ehrlich's square eye-piece.

Using such methods it has been possible to inoculate patients with known numbers of sporozoites, varying from 50 to 560,000. *N. W.*

FULTON (J. D.). **Studies in the Chemotherapy of Malaria. The Distribution of Anti-Malarial Drugs between Red Cells and Serum.**—*Ann. Trop. Med. & Parasit.* 1937. Apr. 8. Vol. 31. No. 1. pp. 7–14. With 1 fig. [13 refs.]

Attempts to decide whether quinine becomes localized in the red cells, and thus held in high concentration in contact with the malaria parasites, have been made by a number of workers, using various methods, with rather conflicting results. The author has used the biological method of Rona and Bloch (*Biochem. Ztschr.*, 1921, Vol. 121, p. 235) which is applicable to the estimation of fractions of a milligramme of anti-malarial drugs, and depends upon an ingenious application of a surface-tension method to the determination of the velocity-constants of the hydrolysis of tributyrin by lipase, as well as the observation that in the case of human serum lipase, increase in the concentration of the anti-malarial in geometrical progression is accompanied by a fall in the velocity constants in arithmetical progression. The distribution between red cells and serum of twenty drugs of known constitution and anti-malarial activity was determined in this way.

No indications of general connexions between the partition coefficient and the nature of the compounds examined, or their anti-malarial activity, emerge from the results, except that four laevorotatory alkaloids occur together high in the list (although the highest is hydroquinidine, which is dextrorotatory), and that the first six compounds, with high partition coefficients, are good anti-malarials. No relationship is obvious for the others. In sixteen cases the partition coefficient is found greater than unity, ranging between 1·3 and 2·9. *W. H. Gray.*

CHRISTOPHERS (S. Rickard). **Dissociation Constants and Solubilities of Bases of Anti-Malarial Compounds. I.—Quinine ; II.—Atebrin.**—*Ann. Trop. Med. & Parasit.* 1937. Apr. 8. Vol. 31. No. 1. pp. 43–69. With 6 figs. [43 refs.]

The non-arsenical anti-malarial drugs have as a common feature of chemical constitution (*a*) one nitrogen atom forming part of a heterocyclic nucleus (quinoline or acridine), as well as (*b*) one or more other basic centres. Amongst the synthetic drugs, for example, no quinoline or acridine derivative which does not contain an amino-group shows any indication of anti-malarial activity. The nitrogen atom (*a*) is very weakly basic, but the others may be fairly strong. The author points out that the latter may provide the mechanism for combination with the proteins of the tissues or parasite, so that the strength of the base will have an important effect upon the development of anti-malarial action, and he has accordingly determined the basic dissociation constants of quinine and atebrin.

For quinine, by electrometric titration with the glass electrode, the first dissociation constant, due to the quinuclidine nitrogen, corresponds to $pk_1=5{\cdot}70$; the second, $pk_2=9{\cdot}85$. Values in close agreement with these were obtained by indicator (cresol red). Atebrin has two well-defined constants, and probably a third, due to the acridine nitrogen, which is weaker than $pk_3=11{\cdot}0$. Only pk_2 could be determined by titration and was found to have the value 6·47 ; owing to the very low solubility of the base, titration could not be carried into the range of the first constant, so the partition coefficient of undissociated base between ether and water was determined, and pk_1 calculated from this to have the value 3·87. A new solubility method gave figures in good agreement with these. The solubilities of the bases were also determined ; atebrin base as 0·000084 [grammes per cc.?] varying little between 0° and 35°C., quinine trihydrate as 0·0007 at 20°, and anhydrous quinine as 0·0015 at 20° ; the solubility curves of the two latter are given. The solubility product of anhydrous quinine is $10^{-8\cdot33}$, and that of atebrin $10^{-8\ 68}$. Attempts to isolate atebrin mono-hydrochloride have been unsuccessful. *W. H. Gray.*

CHOLERA.

League of Nations. Health Organisation. Eastern Bureau, Singapore. Annual Report for 1936. pp. 8–40. With maps 1–8 & graphs 1–45.—**Plague in Countries; Plague in Ports; Cholera in Countries; Cholera in Ports.**

A great part of this report, so far as it relates to plague and cholera, is taken up by maps and graphs which give a clear readable view of the state of affairs during 1936 for the area covered. It is quite obvious that the arrangements for distributing information regarding infectious diseases with rapidity are extremely efficient. The data here set down are of the nature of records whose value will increase with time.

During 1936 " the improvement in the plague position in the Eastern zone " which was manifest during 1935 has continued. Thus, only 12,258 cases were reported from British India as compared with 27,923 in 1935. Java also reported decrease in 1936. " The satisfactory position as regards plague in 1936 has been reflected in the ports and in the absence of any plague infected ship being notified during the period under review."

In the case of cholera, like plague, the year 1936 was with some few exceptions, one of decrease. Siam showed a considerable increase and the disease was epidemically prevalent in Bengal in the early part of the year. " The Philippine Islands and all ports of China, Indo-China and the Dutch Indies have remained free from cholera throughout the year." *W. F. Harvey.*

Kiribayashi (S.) & Aida (T.). **Fishing Vessels requiring Surveillance from the Standpoint of Disease Prevention, and Cholera Bacillus isolated from the Crew of Such Vessels.**—*Jl. Public Health Assoc. Japan.* 1937. Feb. Vol. 13. No. 2. pp. 1–2.

The fishing industry has greatly developed in recent years in Japan. It has been found that vessels of small type engage in fishing and may go far afield in this pursuit. Thus, the smallness of a vessel is no sufficient reason for relaxation of medical inspection. An illustration of this was afforded by the occurrence of a case of cholera on board a motor fishing vessel. The organism was isolated from the stool of the patient, who died, and two of his sailor companions were found to be carriers. *W. F. H.*

Taylor (J.), Pandit (S. R.) & Read (W. D. B.). **A Study of the Vibrio Group and its Relation to Cholera.**—*Indian Jl. Med. Res.* 1937. Apr. Vol. 24. No. 4. pp. 931–945. [12 refs.]

Much that is of the highest importance to laboratory workers on the cholera vibrio is contained in this study. It deals with a total of 558 inagglutinable vibrios and has necessitated an examination of at least 1,000 different strains. The term inagglutinable is restricted " to vibrios which do not show the ' O ' antigen of the typical *V. cholerae.*" Serological investigations were carried out with strains which " did not agglutinate with a serum prepared against dried ' O ' antigens of Inaba and Ogawa types " and the further serological testing of these strains was carried out by means of 33 sera prepared specially for the purpose. The specific characters of the antigenic vibrio furnishing these sera are given in a table.

A number of tests was applied to the differentiation of the vibrios under the heading biochemical reactions:—(a) fermentation of mannose, saccharose and arabinose, which are the sugars of *Heiberg*; (b) cholera red and indole reactions; (c) Voges-Proskauer reaction, in that modification "in which d-naphthol is employed along with potassium hydroxide"; (d) haemolysis of goat erythrocytes and (e) gelatin liquefaction.

"In the course of this investigation no example of variation amongst the strains has been experienced in the course of ordinary subculture."

A number of interesting points have emerged in this study and are set out in the discussion: (1) "On the basis of simple agglutination tests without a detailed antigenic analysis 56 per cent. only of the strains have been classified. In order to effect this, sera were prepared against 33 vibrio strains and 31 serological groups have been defined. Of the 311 vibrios classified, 57 were classified in Gardner and Venkatraman's groups II to VI . . . . The remainder belong to newly defined serological groups. . . . It is unlikely that a series of the size dealt with here includes more than a fraction of the existing vibrio types . . . The serological heterogeneity of the cholera-red negative strains is of a very much higher degree than of the cholera red positive organisms." (2) Similar heterogeneity was demonstrated by grouping on the basis of a combination of reactions with six sugars, the cholera-red and the Voges-Proskauer tests. By this means 17 different types of inagglutinable vibrios were capable of separation and of these 13 had been isolated from cases of 'clinical' cholera. It was found "that the results of serology and the cholera-red test are, with extremely few exceptions, uniform. The Voges-Proskauer test to a marked extent follows the cholera-red test." In fact, "with the inagglutinable vibrio strains it appears that an almost infinite variety of combinations is possible, although the vibrios within one serological group are for the most part uniform on all counts." (3) In this series of *inagglutinable* vibrios the authors found little evidence of causal relationship with cholera. The 'Rangoon Rough' strain may possibly prove to be an exception to this statement for it showed a relatively high incidence in an epidemic year, but the evidence is incomplete.

Conclusions are drawn on the strength of the work done in this large vibrio series and they may be set down as:—(1) "Vibrios of serological type differing from the true *V. cholerae* do not produce cholera." (2) "Observations made on the typical vibrios would not suggest that it is likely that the inagglutinable strains can develop into the typical agglutinable form."

An appendix gives all the details of technique and 11 tables containing the data on which the findings are based. *W. F. H.*

Shrivastava (D. L.) & Seal (S. C.). **Preparation and Properties of a Specific Polysaccharide from a Strain of** *Vibrio cholerae.*—*Proc. Soc. Experim. Biol. & Med.* 1937. Mar. Vol. 36. No. 2. pp. 157–161.

All the details of the method of preparation of a specific polysaccharide of the cholera vibrio, known as Inaba variant group VI, are given in this communication. The polysaccharide gave zone reaction with homologous antiserum between dilutions of 1–4,800 and 1–150,000 and then "a gradually increasing floccular reaction up to 1–12,000,000 after which it disappeared." Specificity was further proved by testing

antisera of group I to VI vibrios for precipitin reactions to "Inaba variant (group VI)" polysaccharide and "Inaba (group I)" polysaccharide. These were either specifically positive or specifically negative. It was especially interesting to note that three El Tor antisera were not reactive with the Inaba polysaccharide. "El Tor strains cannot be differentiated from cholera strains by 'O' agglutination (GARDNER and VENKATRAMAN); or by the vibrio polysaccharides prepared by Bruce WHITE, but they appear to be differentiated serologically by the polysaccharide used in the present experiments." *W. F. H.*

WHITE (P. Bruce). **Regarding Alleged Transmutation in Vibrios.**—*Jl. Path. & Bact.* 1937. Mar. Vol. 44. No. 2. pp. 490–492.

The mutation of the cholera vibrio is, as the author points out, constantly invoked as an explanation of the appearance of strains with characters quite different from those of their alleged parents. He is evidently raising a warning voice against a too ready acceptance of what he calls the *fait accompli*, as representative of the true causal sequence of events. That a first plating of stool should afford colonies genetically related is a "matter of pure assumption." Again, "the possibility of intercurrent infection with vibrios during mouse passage experiments is not entirely ruled out." Heart blood cultures from dead or moribund mice may yield vibrios which have invaded the organism from the intestine and have nothing to do with the cholera vibrios administered. The author, however, does not press intercurrent infection as the probable origin of the "mutant" strains. When, on the other hand, a culture "infected with a particular bacteriophage is alleged to have been derived from one in which that bacteriophage is absent," he, himself, considers that "the simple and obvious indication is that the alleged mutant cultures are not derived from the parents presented." *W. F. H.*

SEAL (S. C.). **Rough and Smooth Cholera Vibrios in Relation to their Mode of Division and Growth.**—*Indian Jl. Med. Res.* 1937. Apr. Vol. 24. No. 4. pp. 991–999. With 6 plates.

Rough colonies of *V. cholerae* are opaque and may vary in "roughness" from the slightly granular to those with a highly rugose surface, and irregular margin, which are described as "medusa-head" colonies. Smooth colonies are translucent and have a regular margin. There are many differences between the organisms composing these two types of colony and these may be classified under the headings, cultural characters, clinical constitution, biochemical serological and immunological behaviour, toxicity, metabolic activities and surface charge. The present study is devoted to determining "whether there is also a difference in the mode of growth of the individual bacteria comprising these rough and smooth colonies." The growth and division of the bacteria was continuously observed under dark ground illumination, the technique of which is given in detail. It was found that "a combination of 0·5 per cent. agar and 12 to 15 per cent. gelatin forms a satisfactory medium for watching the growth of the rough and smooth types." An exact correspondence of the mode of division from a single vibrio of the rough and the smooth colony was found to that for organisms from similar colonies of the *Salmonella* group and it seems possible that the phenomenon is a general one. The essential difference

between the two vibrios " depends upon the degree to which the contiguous cells adhere to each other after undergoing division." The final smooth colony is produced by the vibrios sliding past one another to form an even and compact mass. In the rough colony there is none of this tendency for the bacteria to slip past each other and " the cells after division tend to adhere to each other more firmly, leading to the formation of bending and branching chains and irregular masses with many open spaces, projections, angles and sometimes chains, the final cluster being thus jagged and uneven in appearance." Several very instructive plates accompany the article to illustrate the process. *W. F. H.*

READ (W. D. B.) **A Note on the Bacteriological Findings in Clinical Cholera in Calcutta in Relation to Epidemiology.**—*Indian Jl. Med. Res.* 1937. Apr. Vol. 24. No. 4. pp. 979–990. With 1 chart.

In Calcutta cholera is constantly present and there is no reason to suppose that the cases admitted to hospital are selected. " The figures of the Campbell Hospital and those of the Calcutta municipality are in consonance." In this communication an examination is made of the findings and figures for cholera during the years 1934–36 and a graph and tables have been prepared showing these for 4-weekly periods. Seasonal variations in the admissions to the Campbell Hospital are recognized and the figure of 100 admissions per 4-weekly period has been arbitrarily taken as " demarcating the commencement and termination of the epidemic period." This leaves an interepidemic interval and it has been divided up by the author into a post-epidemic and a pre-epidemic period. " The pre-epidemic period is defined by a change in conditions, characterized by an increase in the mortality rate together with an increase in the percentage of the typical *V. cholerae* without any marked increase in the total number of cases occurring." " Proved " cholera cases are taken to be those in which typical agglutinable vibrios have been isolated *plus* fatal cases unexamined. Non-examination of stools in conjunction with fatality is taken to mean that the patients were admitted to hospital in a moribund condition and that they would have probably shown agglutinable vibrios. It was found that the mortality of " proved cholera " did not vary greatly throughout the year. Cases diagnosed as cholera and furnishing inagglutinable vibrios were at their maximum in the epidemic periods and one post-epidemic period of the two years investigated. *W. F. H.*

PLAGUE.

Guiart (Jules). La peste reviendra-t-elle? [**Will Plague Return?**]—*Rev. d'Hyg. et de Méd. Préventive.* 1937. Apr. Vol. 59. No. 4. pp. 241–247. [14 refs.]

The author contends that of the two rats which play a rôle in plague, *Mus rattus* and *Mus norvegicus*, the former is much the more important. *Mus rattus*, the black rat, is a domestic rat and may be said to live in close association with man. It came originally from India and was introduced into Europe in the 12th century, after the Crusades. The great European epidemics of the 14th and 15th centuries were the result. *Mus norvegicus*, the sewer rat, displaced the black rat in Europe and so plague disappeared, because the sewer rat is not a commensal of man. The argument goes further than this, for it applies to the differences in action of the fleas which are peculiar to the two rats. *Xenopsylla cheopis* is the special flea of *Mus rattus*, which is the rat that abounds in warm countries. It is *Xenopsylla cheopis* which has a predilection for man and which transmits plague from rat to man; it is for this reason that human plague abounds in warm countries. The flea infesting *Mus norvegicus* is *Ceratophyllus fasciatus*, without any part to play in the transmission of plague from rat to man, although quite capable of transmitting the disease from rat to rat. If, therefore, plague has disappeared from Europe it is because the rat and flea of Europe are *Mus norvegicus* and *Ceratophyllus fasciatus*, respectively.

When, however, a steamer arrived from India in the Seine in 1917 it had plague-stricken *Mus rattus* on board with its flea parasites *Xenopsylla cheopis*. A case or two of human plague occurred at Levallois, but did not extend further to man. An epizootic next broke out among rats. The rats had multiplied and there was great mortality among these in 1918 and 1919. In 1920 a small epidemic broke out, for which the sequence of events here narrated is regarded as responsible. It was, however, vigorously dealt with and suppressed. The deduction is made that at all costs *Mus rattus* must not be allowed to re-establish itself in Europe. *W. F. Harvey.*

Public Health Reports. 1937. Apr. 2. Vol. 52. No. 14. pp. 412–414.—**Overseas Transmission of Bubonic Plague. A Danger almost Eliminated.**

Maritime transmission of plague from one country to another is dependent mainly, if not wholly, on the escape of infected rats from ships and the transfer of their infected fleas to shore rats. This is how an epizootic is started and how ultimately human plague results. A survey of ships at Atlantic ports by the Public Health Service of America has disclosed that only 8·4 per cent. of calling ships were infested with rats. This figure, when compared with the 50 per cent. rat infestation of ships between 1925 and 1927, shows what the efforts made to free ships from rats has brought about. "The specific factors responsible for this satisfactory condition are effective fumigation, rat-proofing of vessels, international certification and intensive rat-infestation inspection." Rat-free vessels qualify for reduction of quarantine delays and the expense of port dues. Much more can be

saved by continuance of these preventive measures, for "it would manifestly be foolhardy to relax the precautions that have brought about the decrease of rat populations on ships." *W. F. H.*

VINCKE (I.) & DEVIGNAT (R.). Le foyer de peste du Lac Albert. [**Lake Albert. A Plague Focus.**]—*Ann. Soc. Belge de Méd. Trop.* 1937. Mar. 31. Vol. 17. No. 1. pp. 87–110. With 2 maps & 1 chart.

The existence of plague infection in the region of Lake Albert was more or less suddenly discovered in 1928 by a medical missionary. Further investigation followed, which confirmed the original announcement and it is stated that probably plague has been prevalent in this part of the Belgian Congo for 30 years. It seems to have been introduced from Uganda. The natives of the shores of Lake Albert and of Uganda belong to common stock; the same intermediate host, *Mastomys coucha*, var. *Ugandae* and the same vector fleas, *Xenopsylla braziliensis* and *cheopis*, are concerned in the transmission of the disease.

A novel method was adopted for defence of the villages against rats. Deratization of the villages themselves had been carried out some time before and was apparently still effective. A trench was now dug around the village of width 45 cm., depth about a metre and with vertical sides. Drainage was provided for in a direction away from the village. The rats coming in from the bush attempt to jump the trench, fall in and cannot climb out again. Some of them escape back again to the bush by the drainage channels. The soil of this region was favourable to trenching and it was easy to make repairs to landslips. *W. F. H.*

GERBER (M.). **Plague Campaign, 1935.**—*Bechuanaland Protectorate Ann. Med. & San. Rep. Year 1935.* Appendix A. pp. 25–35.

Plague campaigns tend to be long continued. In this case we have the account of one which has been originated, prosecuted and closed all within the space of 12 months. Rodent plague was discovered early in 1935 in close proximity to the Bechuanaland border. It was therefore decided to have Europeans "specially trained in rodent surveys and rodent destruction measures" with a view to combating the menace. This was done, the instruction obtained, surveys instituted and anti-plague measures adopted. The last of the rodent officers engaged in the work was discharged in November 1935. By that time there were definite signs that the veld rodents were breeding again and that the plague mortality among them had disappeared. It usually "takes 8 to 12 months for an epizootic of rodent plague to burn itself out . . . . . an epizootic of rodent plague kills off about 90 per cent. of veld rodents, mainly gerbilles. It takes about three years for the 10 per cent. remaining to breed up to their normal density of population and when this has taken place, plague again breaks out." Thus it is improbable that another epizootic will occur for another 3 years.

An important part of the campaign employed was to use cyanogas for rodent disinfestation. All European traders and farmers were urged to purchase pumps and cyanogas. All consignments of grain and hides on the railways were disinfested. In the Native reserves the co-operation and active assistance of the chiefs were obtained, in

order to have huts and granaries treated with cyanogas. Altogether 39,186 huts were so treated. By the end of July 1935 nearly every native village where rodent plague was found had been dealt with and was practically rodent-free. No human epidemic developed, but two human cases of bubonic plague were discovered and both of those recovered.

It is a little disappointing to note that, although each native tribe "was supplied with a certain number of pumps and cyanogas free of charge" and that no lack of assistance was rendered to government officers by the chiefs, the expectation that the natives would continue with the work was not wholly fulfilled. "No sooner had the rodent officer completed work in a village and left than the residents settled down and took no further measures in the majority of instances."

W. F. H.

Raybaud (A.). Le rôle du chat dans la transmission de la peste. [**The Rôle of the Cat in Plague.**]—*Marseille-Méd.* 1937. Dec. 25. Vol. 73. No. 36. pp. 713–718.

The cat may be used effectively as a check upon the increase of rats but this is not to be regarded as a very efficient antiplague measure. Indeed the cat itself may develop and transmit plague. A number of examples are given where this has taken place. It is pointed out that *Ctenocephalus felis* will "bite man as well as *Xenopsylla cheopis* and better than *Ceratophyllus fasciatus*." The cat flea is a carrier of plague.

W. F. H.

Girard (G.). Technique simplifiée de prélèvements pour identification du bacille pesteux sur le cadavre. Son application à Madagascar. [**Simplified Technique for the Diagnosis of Plague Bacilli Post Mortem.**]—*Bull. Soc. Path. Exot.* 1937. Mar. 10. Vol. 30. No. 3. pp. 240–247.

The native of Madagascar, although objecting to post-mortem examination, makes no objection to the diagnostic puncture of organs in the dead body. It is this method which has been elaborated to establish a diagnosis and thus prevent the spread of pulmonary plague. In the living patient the punctures are made of the bubo. After death aspiration of material from the liver and from both lungs is carried out. Several washings of the aspirating syringe with 3 cc. of 0·8 per cent. salt solution provides a suspension, which is rubbed on to the scarified abdomen of a guineapig. Where delay in carrying out the examination must take place, the use of the following fluid for suspension has proved satisfactory :—Calc. carbonate 2 : glycerin 20 ; water 80. Experiments have been made which show that, at temperatures of 17°, 25° and 37°C., such a suspension will still serve for test up to 6, 6 and 3 days respectively. Smears are made from the suspensions and, on arrival at the laboratory, culture and animal tests are also carried out.

W. F. H.

Bessonowa (A.). Noch ein Fall von Pigmentbildung des Pestbazillus. [**Another Case of Pigment Formation by the Plague Bacillus.**]—*Giorn. di Batteriol. e Immunol.* 1936. May. Vol. 16. No. 5. pp. 754–760.

Deviations from the usual characters which define a bacterial species are of both theoretical and practical interest. Pigment

formation is not one of the distinguishing features of colony growth in the plague bacillus and indeed was not even described as occurring until the year 1927. Various strains have however now been isolated with this peculiarity. The cultures in which the phenomenon appears are usually old, but the capacity to produce pigment is transmissible to subculture growths. In the present instance the pigment-producing strain had been obtained from India and isolated from a case of bubonic plague. Previous strains with the capacity for pigment production have given black colouration. The present strain was yellow and developed other colours in the various generations of subculture—brown and rose-pink. These pigment-producing strains of *Past. pestis* may very commonly give quite unpigmented growths on subculture. It takes 10 to 15 days for the pigment to develop. A whitish irridescent film free of bacteria also developed on the agar surface of the pigment-producing cultures. The usual tests were applied to the isolated organism to prove that it was, actually, *Past. pestis*.

W. F. H.

Sokhey (S. S.) & Maurice (H.). Sur les pouvoirs protecteurs relatifs de vaccins antipesteux préparés, les uns au moyen de cultures tuées par la chaleur, les autres au moyen de cultures vivantes avirulentes. [**Protective Power of Heat-Killed Virulent and Living Avirulent Plague Vaccines.**]—*Bull. Office Internat. d'Hyg. Publique.* 1937. Mar. Vol. 29. No. 3. pp. 505–513.

Measurement of protective power and of virulence is attainable by using a dose of which the content in bacilli is known and by using the white mouse as the testing animal because it is susceptible and gives a constant reaction. One of the objects of the research work here described was to measure the relative immunizing power of killed virulent bacilli and living but avirulent bacilli. A most important point in this comparison was that the same strain of organism was used for both these tests. The organism was rendered avirulent without loss of antigenic power by culture at 37·5°C. on agar for about 60 to 70 weeks with weekly subculture or by growing it continuously for 10 weeks in nutrient bouillon at the same temperature. Thus, for example, an original culture, which killed 5 mice out of 5 by subcutaneous injection of only 12 bacilli, failed to kill any mice by the 64th subculture even in subcutaneous dose of 64,000,000 bacilli. An experiment which made comparison of the protective value of the two types of the same strain of organism gave the minimum protecting dose against the standard infecting dose as 0·002 cc. for the vaccine killed by heat and 0·3 cc. for the avirulent living vaccine. These protective results are obtainable not in mice only but in guineapigs and rats also. The reason why previous workers have been unable to get immunization of these susceptible animals with killed cultures is that they have used too high a temperature for too long a time for the purpose of killing. The authors kill their cultures by heating for 15 minutes at 55°C. The value of this low temperature and short time is brought out by an experiment showing how the minimum protective dose for mice with a culture thus killed was 0·002 cc., whereas for a culture killed by heating one hour at 60°C. it was 1·5 cc. Killing with 0·5 per cent. phenol without heat is as good as heating for 15 minutes at 55°C., and more efficacious than if the killing is done with formol. *W. F. H.*

DE VOGEL (W.). La vaccination antipesteuse à Java (Indes Néerlandaises) avec un virus vivant. Quelques résultats enregistrés jusqu'au 11 juillet 1936. [**Antiplague Vaccination with Living Organisms.**]—*Bull. Office Internat. d'Hyg. Publique.* 1937. Mar. Vol. 29. No. 3. pp. 514–527. With 5 diagrams (1 folding).

The work of OTTEN in Java merits close attention because it is conducted on lines which endeavour to make comparison of the vaccinated and non-vaccinated under strictly comparable conditions of age and sex distribution, with the employment of an alternate case method of selection. So far as they go, the figures are very favourable to the use of living vaccine. A total of 37,435 vaccinated with mortality of 1·01 per thousand is set over against the total of 39,483 non-vaccinated with mortality of 5·05 per thousand. A five-fold reduction of mortality is evident here and OTTEN hopes to make the reduction a ten-fold one. *W. F. H.*

ROBIC (M.). Sérothérapie dans la peste pulmonaire primitive. [**Serum Therapy in Primary Plague Pneumonia.**]—*Bull. Soc. Path. Exot.* 1937. Feb. 10. Vol. 30. No. 2. pp. 204–208.

A former method of preparation of antiplague serum was to hyperimmunize horses by intravenous injection of living plague bacilli. This was given up owing to the danger of the manipulations and the severe reactions produced in the horses. It has now been revived by the author who, however, uses the avirulent strain "EV." It has been possible to reach a dose of two bottles of living plague culture, which is given intravenously. The results obtained with the new serum in animals and in bubonic plague are favourable and will be reported when the numbers treated are sufficient to support valid conclusions. In the present communication a description is given of a patient 26 years of age who contracted plague pneumonia from her husband. She was treated with the serum and received in all 1½ litres of which 720 cc. were intravenous. The treatment did not prevent death, but life was prolonged to 11 days instead of the 3 days, which is the usual limit for a patient with plague pneumonia. *W. F. H.*

BULLETIN DE L'OFFICE INTERNATIONAL D'HYGIÈNE PUBLIQUE. 1937. Mar. Vol. 29. No. 3. pp. 528–535.—Instructions pour le service de la lutte contre la peste. [**Antiplague Instructions.**]

Poisons.—These ought to be slow of action so as to allow time for the rats to abandon houses and die outside, or in their nests: it is not desirable that infected fleas should be left in a house. The following poisons are recommended: (*a*) maize flour coarsely ground 35; the best wheat flour 35; grated cheese, ground dry fish, dried blood or ground up beef 15; commercial arsenic 15. (*b*) Fresh fish 85; commercial arsenic 15. (*c*) Slaughter-house blood heated to a jelly 60; barley, wheat or maize flour or ground salt-fish 25; commercial arsenic 15. The mixture can be spread on bread, banana or paper and it is necessary to alter the ingredients of the mixture from time to time to prevent the rats becoming accustomed to it and so ceasing to eat it. These poison baits are to be placed in the holes of

rats, on their tracks, on beams, under large pieces of furniture and in sheltered places. Twelve or more poisoned baits will be required for an ordinary house. Poison ought to be continuously put down in places where plague exists. In a small town or village where two to three days suffice to clear houses of rats, it will be sufficient to put down poison once a month. If no plague has occurred for a year, poison baits will only be required every six months.

Traps.—As a method of rat extermination this is expensive and of doubtful value. It is used to obtain rats for the diagnosis of the existence of plague and determination of the proportion which are infected. A man can attend to 100 to 200 traps a day. In the large towns and ports where plague exists, 40 to 50 traps should be set per day per 1,000 inhabitants. Baits should be of substances common in the locality and should be handled as little as possible. It is also necessary to clean traps thoroughly before they are returned to use. Rats which are captured alive must be asphyxiated and then combed for fleas. The flea is placed for 24 hours in pure phenol to make it transparent, so that its species and sex may be made out. The total number of fleas divided by the number of rats gives the " flea index."

Rat Autopsy.—These rats are immersed for 10 minutes in 5 per cent. creoline containing a little soap or kerosene. Signs of plague infection are: Intense subcutaneous haemorrhage; inguinal, axillary and cervical buboes of purple colour, surrounded with gelatinous oedema; pleural and pericardial effusion; small haemorrhages and consolidations in the lungs; a purple, friable, enlarged spleen with pin-head abscesses and the same lesions in the liver; deep red enlarged suprarenals; enlarged and haemorrhagic mesenteric and retroperitoneal lymph nodes. Films should be made from all lesions and stained. If there are no obvious plague lesions portions of spleen and liver should be ground up in a little sterile water and rubbed on the scarified skin of a guineapig with the pestle used in the grinding. The guineapig should die of plague in 5 to 10 days with characteristic lesions.

Indices.—Note should be taken of: (*a*) The number of rats of each species, (*b*) the number of males, females and pregnant females, (*c*) the number of rats found infected with plague and their percentage, (*d*) the number of fleas per rat, classified according to genus, species and sex and the percentage number. The plague index or percentage of rats infected is of great value in judging the efficacy of antiplague measures. When fleas are most active and abundant, a 2 per cent. rat " plague index " presages the imminence of epidemic plague. If the flea index is not greater than 3 per rat, epidemic plague is not to be feared.

Protective Zones for Towns.—A clearance zone of 100 to 200 metres free of brushwood, vegetation, heaps of stones and collections of wood, etc., should be maintained round a town to prevent possibility of contact between sylvatic and domestic rodents. *W. F. H.*

Wu (C. Y.). **Some Modern Trends in Plague Work.**—*Reports National Quarantine Service Ser. VII—1937.* pp. 108–127.

A very useful review of the practical problems of plague work is presented in this lecture under such headings as diagnostic methods, the problem of infected and infective fleas, flea investigations in China, serum therapy, vaccine prophylaxis and rat proofing. Most of the matter treated covers familiar modern ground.

A valuable method by which animals can be diagnosed as dead from plague, especially useful in the case of decomposed animals, is the examination of bone marrow from the humerus.

A shrewd reference is made to views which upheld the possible causation of plague through rodents other than rats or even transmission from man to man. When an epizootic of plague has broken out among the domestic rat population it may be quite difficult to get any of these animals for laboratory examination owing to the heavy mortality among them. It should not, however, be concluded on this account alone that the human outbreak is not rat-caused.

A distinction is drawn between infected and infective fleas. Not every flea which has become infected is able to transmit infection and, indeed, Indian observers have gone so far as to say " that even under the most favourable conditions only an occasional *infected* flea becomes *infective*." Three rat fleas appear to be common in China, *Leptopsylla musculi*, *Ceratophyllus anisus* and *Xenopsylla cheopis*. The author's observations " confirm the generally accepted view of the close correlation between a high *cheopis* index and plague incidence."

Little faith is placed in serotherapy, but " solid progress has been achieved in the realm of vaccine prophylaxis." An attempt is made by the author to " assess the relative merits of the three categories of vaccines." These are some of the advantages and disadvantages of each: (1) Agar grown vaccine is quickly and easily prepared and is simple to standardize. It gives a comparatively mild reaction. Possibly its potency might be increased by reducing the time and temperature in its sterilization. (2) Haffkine's vaccine is tedious to prepare and not easy to standardize. (3) Evidence presented in favour of the use of living avirulent virus as vaccine is regarded as impressive. This section on vaccines concludes with the remark that " until the connection between man and rodent is severed it is idle to hope for a complete eradication of plague in endemic areas."

In conclusion, the question of rat proofing is discussed. " The science and art of rat-proofing has come to the fore in recent years as the most effective measure in our concerted attack upon plague." This procedure is defined, " as the mechanical process whereby a structure is rendered safe from rodents." The method—owing largely to its temporary efficacy and costliness—has " found its greatest usefulness in the campaign against rats on board ships."

W. F. H.

HELMINTHIASIS.

Vassilkova (Z.). Sur la déshelminthisation des eaux d'égout épurées par méthodes intenses. [**Helminthic Ova in Sewage Works.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 5. [In Russian pp. 657–673. With 3 figs. [16 refs.] French summary pp. 673–674.]

Examination of the sewage effluent at the Toula works and of the sludge there and at Kojoukhov (Moscow) showed the presence of ova of ascaris, trichuris, enterobius, diphyllobothrium and taenia, up to nearly 2,000 per litre. In the Imhoff tank nearly all were removed (97 per cent.), in a second sedimentation reservoir 87 per cent.; biological filtration reduced the total by 18–26 per cent. only. Chlorine methods of purification did not affect the vitality of the ova. The sludge contained 466 ova per gram, the same five species being found; methane fermentation reduced this number by about a fifth. They might remain alive up to 2 years in sludge kept in the open. Methods suggested by the author for getting rid of or destroying them include sand filtration, raising the temperature in the methane reservoirs to 45°C., prolonging the sedimentation time and others. *H. H. S.*

Basnuevo (Jose) & Anido (Vicente). Manera de conservar huevos de helmintos. [**Preservation of Helminth Ova.**]—*Medicina de Hoy.* Habana. 1937. May. Vol. 2. No. 5. p. 300.

The authors recommend the addition of 25 cc. of the following to 100 gm. of faeces: formol 15 cc., glycerin 20 cc., water 100 cc. If the faeces are not liquid or pasty 25 cc. distilled water should be added to homogenize them. If the eggs are scarce, he suggests addition of 100 cc. of water and passage through a fine-meshed sieve, collection of residue in centrifuge tubes, running down vigorously, pouring off the supernatant fluid and adding to the residue an equal amount of the formol-glycerin solution. They will thus be preserved, indefinitely. The process is good also, they state, for preservation of protozoal cysts. *H. H. S.*

Denecke (Karl). Der Befall mit menschlichen Darmhelminthen auf der Elbinsel Finkenwärder und seine Drsachen. [**The Incidence of the Intestinal Parasites of Man in Finkenwärder, an Island in the Elb.**]—*Arch. f. Hyg. u. Bakt.* 1937. Mar. Vol. 117. No. 6. pp. 332–362. With 1 fig. [35 refs.]

There is a survey of the literature dealing with ascaris and trichuris infection in Europe varying from 1 and 4 per cent. respectively in Hamburg to 78 and 63 per cent. in Switzerland. The island of Finkenwärder lies across the boundary between Hamburg and Prussia with a population of 5,680, of whom 5,154 were examined by Telemann's technique and 1,000 by Fülleborn's gravity floatation method as well. Of this 1,000, the numbers positive for eggs to Telemann's and Fülleborn's techniques were respectively—for trichuris 276 and 115, ascaris 51 and 31, enterobius 6 and 7, *T. saginata* 4 and 0, Fasciola 1 and 0, Heterodera 1 and 0, mite 2 and 1. The total percentages of infection found were: trichuris 18·76, enterobius 5·91, ascaris 5·06, taenia 0·44, *H. nana* 0·01. The incidence is further dealt with by

localities, age and sex. In 2,466 persons in whose gardens human faeces from pail privies was not used as manure the percentage of ascaris infection was 2·6 and of trichuris 12·8 ; in 2,375 in which it was so used the percentages were 7·9 and 26·0. In carriage of infection, drinking water was not concerned, but those in whose gardens salads or strawberries were grown had heavier infections with ascaris and trichuris than those in which they were not. *Clayton Lane.*

Ling (L. C.) & Yao (Y. T.). **The Incidence of Intestinal Parasites in Kweiyang and Southern Yunnan.**—*Chinese Med. Jl.* 1937. Mar. Vol. 51. No. 3. pp. 381–384.

The incidence of intestinal parasites in 4 communities as displayed by two smears of unstated size, one made with normal saline, the other with Donaldson's iodine and eosin.

The places are about 5,000 feet up in latitudes about 22 to 26. The disclosed percentages of infection were : Ascaris 65·91 to 92·65, trichuris 0–34·91, enterobius 0 to 0·12, *E. coli* 4·55–17·16, *E. histolytica* 0 to 2·83, *E. nana* 4·08 to 10·38, *I. butschlii* 0 to 3·77, Giardia 2·7 to 6·81. All of 106 miners had one infection or another.

C. L.

Leathers (W. S.) & Keller (A. E.). **The Prevalence and Distribution of *Ascaris lumbricoides*, *Trichuris trichiura* and *Hymenolepis nana* in South Carolina.**—*Amer. Jl. Hyg.* 1937. Mar. Vol. 25. No. 2. pp. 292–302.

A faecal survey in 44 counties of South Carolina from examination of 0·05 gram of faeces diluted in decinormal caustic soda solution.

Faecal specimens numbered 28,875 from whites. Of these 4 per cent. (0·2 to 11·4) were positive for ascaris covering 41 counties. So far as it is considered fair to compare examinations made by different techniques this may be taken as a slight rise in infection from 3·6 per cent. from the period before 1921. The incidence was highest in young children before and after beginning to go to school ; the average intensity was 19,000 eggs per cc. of faeces and of the infections 69·4 per cent. were classed as very light, 22·1 as light, 4·3 as moderate, 3·4 as heavy, and 0·9 as very heavy. The average egg count increased from 7,126 per cc. in a member of a family in which he was the only one infected to an average of 51,169 in each infected person when these numbered 5 or more. In 1,172 the type of ascaris egg was noted and in 40·7 per cent. all were unfertile with an average of 2,570 eggs per cc., in 30 per cent. all were fertile with a like average of 11,300, and in 29·3 per cent. there were both fertile and unfertile eggs with 48,300 as the average. In 595 negroes the percentage of infection was 15·1 and the mean egg numbers 25,000 per cc. Only 11 of the 28,875 specimens from whites showed trichuris eggs to this method of diagnosis, and only 187 showed onchospheres of *Hymenolepis nana*, while in them hookworm eggs were found in 24·8 per cent. *C. L.*

Union of South Africa. Annual Report of the Department of Public Health for Year Ended 30th June, 1936 [Thornton (E. N.), Secretary]. [**Bilharziasis** pp. 26–28.]

A survey of what is being undertaken in the Union for the prevention and cure of bilharziasis.

A survey of snails is in progress, from which it appears that *B. forskalii* prefers standing water with an earth or mud bottom, *L. natalensis* water running over rocks, or vegetation in standing water, *M. tuberculata* rocks preferably in standing water, some 90 per cent. being found so attached, *P. africana* vegetation in standing water, *P. costulatus* rocks in running water, and *D. pfeifferi* rocks in standing water. Native children have interested themselves in collections. *B. forskalii* has proved to be more widespread than suspected and if it is found to be as easily infected in the Union as it is in Mauritius it will prove as big a problem there as is *P. africana*. Of 726 children examined in 21 native schools 63·6 had ova of *S. haematobium* in the urine. Treatment camps for Europeans do temporary good to the treated and, by their useful propaganda value, help in prevention. In the schools the means of infection and prevention have been explained, and a beginning is being made to provide safe swimming pools for them. The fruit of the local *Balanites* (*B. maughami*) has proved deadly to snails and cercariae, but the tree grows very slowly, its fruit ripens and falls from mid-winter [? June] to September, when swimming is least practised, and it never grows naturally near water. In three treatment campaigns fouadin was preferred to other drugs for convenience of handling, because it can cure if care and common sense are used, and because large treatment camps have not had to be arranged for it as has been the case with what seems to be thought the more successful tartar emetic. *C. L.*

Cawston (F. Gordon). **Recent Progress in the Cure of Bilharzia Disease in South Africa.**—*Parasitology*. 1937. Jan. Vol. 29. No. 1. pp. 1–3.

" The efficacy of the drug employed for treating this infection would seem to depend very largely upon its antimony content."

" Experience would show that the vast majority of persons receiving fouadin are incompletely cured of bilharzia infection in South Africa. Due consideration has not been paid to the fact that this easily applied compound contains only 13·5 per cent. of antimony metal instead of 36·46 per cent. as contained in tartar emetic. To reach even half a gram of antimony metal about 60 cc. of fouadin are required. This conclusion, reached by investigating the proportion of metal in antimony derivatives, is borne out by clinical experience.

" The secretary of a hospital board in the Transvaal states : ' It appears that the drug, ' tartar emetic,' is the only sure cure for bilharzia in the long run. During the last ten years about thirty-five patients have been treated with fouadin in this hospital and, invariably, the cases have returned as uncured after a month or two. About two years ago seventy-five school children were given tartar emetic injections as laid down by the Department of Public Health. These cases were all cured permanently.' " *C. L.*

Cawston (F. G.). **Bilharzia Disease in the Cape Province.**—*South African Med. Jl.* 1937. Mar. 27. Vol. 11. No. 6. pp. 208–209.

The only schistosome present in the Cape Province is *S. haematobium* carried by *Physopsis africana*, which snail, it is believed, is absent from streams guarded against human pollution. The need that it

should be demonstrated to school children is urged. The matter of weight of infection has been inadequately realized.

" Professor G. A. H. Rose told me he considered that a patient would harbour hundreds of the parasites and that he had counted a thousand in an experimentally infected animal. I was given about a hundred adult schistosomes in a small excised piece of omentum from a ram at Humansdorp and suppose that this one animal harboured several thousand."

Treatment must be designed accordingly and the advice is that there should be given within a month 20 or 25 grains of a combination of tartar emetic and sodium chloride by injections given on alternate days. *C. L.*

Cawston (F. Gordon). **The Effect of Fish Culture on Fasciola Infection and Schistosomiasis.**—*Jl. Trop. Med. & Hyg.* 1937. May 1. Vol. 40. No. 9. pp. 103–104.

" Fish culture might well be considered in the control of schistosomiasis and fluke disease in stock and of Bilharzia infection of man in parts of Rhodesia and South Africa or other countries where river-water is sufficiently pure and constant. Unfortunately, infection is commonest where river-beds sometimes become dry and in an environment unfavourable for the cleaner fish.

" The Bilharzia committee and Transvaal Education Department are encouraging farmers and others to maintain domesticated duck and fish on their farms where various water-fowl are rapidly disappearing.

" By introducing Black Bass into dams of water Bilharzia infection and Fasciola disease may already have been controlled in some measure in Zululand.

" A visit to private water-lily pools in Natal where *Physopsis* was once breeding extensively resulted in the collection of but a few examples, and this fact could be satisfactorily explained only because the pools are now well stocked with small fish, principally minnows, which would both attack the snails and remove much of the decomposing leaves on which the snails themselves thrive."

C. L.

Sargent (R. M.). **Bilharzial Invasion of Appendix.** [Clinical Memoranda.]—*Brit. Med. Jl.* 1937. Mar. 27. p. 663.

An appendix removed for symptoms of appendicitis had in it schistosome ova. Examination of faeces then made showed no ova, but the urine showed those of *S. haematobium* (for which infection there had never been evidence) and these disappeared after " a heavy course of a proprietary antimony preparation." *C. L.*

Kaufmann (Willy). La schistosomiase de l'appendice par rapport à la schistosomiase de l'intestin et sa signification clinique. [**Appendicitis and Schistosomiasis.**]—*Arch. Internat. Méd. Expérim.* 1936. Dec. Vol. 11. No. 4. pp. 721–750. With 8 figs. [137 refs.]

After discussion of the relationship of parasites to appendicitis and particularly of the three schistosomes of man, three cases are described of appendicitis with appendicectomy, the eggs seen in sections of the organ being judged to be those of *S. haematobium*. *C. L.*

Harkawy (N.). La bilharziose humaine dans le cercle de Bangu. Essai de traitement par divers composés antimoniaux. [**Urinary Schistosomaisis in Bangu (Belgian Congo) and its Treatment by Antimonials.**]—*Ann. Soc. Belge de Méd. Trop.* 1937. Mar. 31. Vol. 17. No. 1. pp. 17–25.

In Bangu the results of treatment of urinary schistosomiasis have not been comparable to those obtained with fouadin in Egypt or Dn 18 in Morocco.

Of 43 patients, 5 had Dn 18 with no relapse, 11 had fouadin with 2 relapses, 11 tartar emetic with 1 relapse, 8 had Dn 18 and tartar emetic with no relapse, 1 had SDT and emetic with no relapse, 3 fouadin and emetic with 1 relapse, 1 had fouadin and Dn 18 with no relapse, 4 had all 3 drugs and 1 relapse. Doses and length of treatment are given in tables. *C. L.*

Guillier (M.). Au sujet de la présence de foyers de bilharziose vésicale dans la région d'Ambanja. [**Foci of Urinary Schistosomiasis in Ambanja (Madagascar).**]—*Bull. Soc. Path. Exot.* 1937. Jan. 13. Vol. 13. No. 1. pp. 112–113.

These two foci are in Madagascar. *C. L.*

Stiven (H.). **Egyptian Splenomegaly.**—Société Internationale de Chirurgie Xe Congrès, Le Caire—30 décembre 1935. 14 pp. With 9 figs. 1935. Brussels : Imprimerie Médicale et Scientifique (Soc. An.), 34 rue Botanique.

A note by Stiven based essentially on his experience of over 800 splenectomies for this condition.

He quotes an unnamed authority as saying that with about 80 per cent. of the population infected with one parasite or another it is for the moment impossible to attribute Egyptian splenomegaly to Mansonian schistosomiasis, but in his view the relationship of the two in St. Kitts and his own experience with the places of origin of his first 400 splenectomies supports the connexion. The public Health Department shows that splenectomies are performed all over the Delta but none in Upper Egypt, and Barlow " categorically states that after many and repeated examinations and investigations no Planorbis snail is found in Upper Egypt, except a small variety at Kom Ombo which it has been found impossible to infect with miracidium hatching out of Schistosoma eggs." " The only remedy for this disease is the removal of the enlarged spleen, for it is found that the spleen continues to enlarge in spite of courses of tartar emetic ; had the splenomegaly been due solely to Schistosoma Mansoni one would have supposed that a course of tartar emetic would have checked the disease." But with this should surely be taken the fact that though a follow up of 12 cases showed a well-marked gain in stature and general health they had all become reinfected. The steps of the operation are given in detail ; it is undertaken only after a course of tartar emetic, a vermifuge, and 6 injections of neosalvarsan. It has a mortality in unselected cases of 12 per cent. ; but, on the other side the " expectation of life is barely three years after the spleen has commenced to enlarge." It is particularly noted that in this disease, as in kala azar, the blood serum globulin is markedly increased.

C. L.

MARTINS (A. Vianna). Sobre a pesquiza dos ovos de "Schistosoma mansoni" pelo methodo da sedimentação, concentração. [**Search for Ova of *Schistosoma mansoni* by the Concentration Method.**]—*Brasil-Medico.* 1937. Feb. 27. Vol. 51. No. 9. pp. 319–321. [12 refs.] English summary.

The author refers to the various procedures that have been recommended for concentration of ova to facilitate research, *viz.*, Fülleborn's, Morin's, Fouad and Helmy's, Khalil's, Hoffman, Pons and Janer's, etc. Having occasion to study the foci of schistosomiasis in Bello Horizonte, State of Minas Geraes, Brazil, he employed the last, as follows :—

Two grams of faeces were taken and placed in a Borrel's flask with 10 cc. water, left for 10–20 minutes till softened, and then carefully broken up with a glass rod, gradually adding another 20 cc. water. The emulsion was then passed through a metal sieve 80–100 meshes to the square centimetre and collected in a conical urine glass and allowed to settle. The supernatant fluid was decanted and 50 cmm. of the deposit spread on a slide and examined.

The advantage of this sedimentation method of concentration over the direct smear is shown by the fact that whereas 10·5 per cent. were positive by direct smear 27·7 per cent. were positive by sedimentation. In three instances where no ova could be found by the former, 63, 70 and 219, respectively, were found by the latter method.

H. H. S.

KNOTT (James). **Fever and Schistosomiasis Mansoni. Report of Two Cases.**—*Puerto Rico Jl. of Public Health & Trop. Med.* 1937. Mar. Vol. 12. No. 3. pp. 306–309. With 3 charts. [Spanish version pp. 310–313.]

"Two cases of *S. mansoni* infestation are reported in two patients who had been out of an endemic area for two and nine years, respectively, and in which the patients had an acute febrile illness with acute enlargement of the spleen and liver. The fever was presumed to be due to the *S. mansoni* infestation." *C. L.*

RODRIGUEZ MOLINA (R.) & PONS (Juan A.). Estudios hematológicos sobre la esquistosomiasis de Manson en Puerto Rico. [**Haematological Investigations on Cases of Schistosomiasis mansoni in Porto Rico.**]—*9a Reunión Soc. Argentina Patol. Regional, Mendoza, 1, 2, 3 y 4 octubre 1935.* Vol. 2. pp. 726–752. [47 refs.]

This study was carried out with great care and included the following : Counts of red and white cells, estimation of haemoglobin in gm. per 100 cc. of platelets, cell volume, colour index and differential leucocyte count. Details are presented in tabular form and are discussed in the text. The original should be consulted by those interested, because the variations are such that the results cannot satisfactorily be abstracted. The cases are classified into three groups according to the stage of the diseases : (1) Early toxaemia ; (2) Intestinal ; (3) Terminal, visceral. The last section of the article consists of short

observations on the treatment of the anaemia by fouadin, by Ferri et ammon. cit., by liver extracts, and, lastly, by splenectomy.

H. H. S.

VAN NITSEN (R.) Essais de traitement de la bilharziose intestinale par les sels de cuivre. Note préliminaire. [**Copper Salts in the Treatment of Schistosomiasis mansoni.**]—*Ann. Soc. Belge de Méd. Trop.* 1937. Mar. 31. Vol. 17. No. 1. pp. 77–82.

Two copper organic compounds, dicuprene and paludex have cured 150 natives of intestinal schistosomiasis.

Dicuprene (capro-oxyquinoline disulphonate of diethylamine) is a readily soluble, neutral, greenish powder with 6·5 per cent. of copper. A 10 per cent. solution is put up in 5 cc. ampoules, the contents of one of these being injected daily into the veins of each of 35 persons, 12 with acute and 23 with chronic illness; in the acute cases symptoms disappeared within 4 and eggs in 3 to 7 days; in the chronic cases eggs disappeared in 3 to 9 days, mostly after 20 to 40 cc. but in one patient after 50 and in another after 70 cc. had been given. At the time of injection there is a metallic taste in the mouth and in 1 patient there was haematuria after 6 injections of 10 cc. each; but it disappeared after 3 days of cessation of treatment and did not come on again when injections were resumed. This was the only possible ill-effect of the drug.

Paludex (cupro-oxyquinoline sulphate of soda) is much like dicuprene in appearance but has 8·37 per cent. of copper, and is given by mouth in tablets each of 20 cgm. the adult dose being 1·5 to 2 gm.; though van Nitsen prefers to start with 5 tablets and to increase the dose daily by 1 tablet, the dose of 2 gm. being reached on day 6 and continued daily to day 9, after which the course stops. Of 115 treated 18 were acute and 97 chronic illnesses. In 13 of the acute illnesses eggs disappeared in 6, and in five of them in 9 days, while symptoms disappeared in half after 2 days and in all after 5. Of 97 chronic illnesses eggs disappeared by 6 days in 39, by 9 days in 43, by 12 days in 9, the maximum being 18 days in 1, about half requiring up to 9 gm. and the rest more, even up to 23 gm. Observation has mostly been for not more than 8 days from the end of treatment, in 8 it was 2 to 3 weeks, in 2 one month, in 1 two months; but no relapses have been reported, most of the patients being inhabitants of the camp at Panda with its stable population.

C. L.

BARLOW (Claude H.). **The Value of Canal Clearance in the Control of Schistosomiasis in Egypt.**—*Amer. Jl. Hyg.* 1937. Mar. Vol. 25. No. 2. pp. 327–348. With 12 figs. on 2 plates, 1 map and 3 graphs.

"The use of canal clearance is proposed as a prime factor in a scheme for the control of human schistosomiasis in Egypt because it is efficient, inexpensive, and requires no teaching of new methods for its execution."

"Little has been written about the snail-environmental conditions of schistosomiasis, a knowledge of which is most important. The optimum environment for both *P. boissyi* and *B. contortus* is fairly clean water, not too deep or swift, with some flow, plant litter, sunshine and shade, good places for egg laying, few natural enemies, and an undisturbed situation. For food, *B. contortus* prefers *Potamogeton crispus*, while *P. boissyi* prefers a rank water grass.

" Intensive snail collections were found to deplete the snail population. This suggested the use of canal clearances as a control measure. An area of over 800 acres was chosen as the site of a clearance experiment. Alternate canals were cleared and the others were left undisturbed for controls. The division was made equal for comparison of results. Three surveys of the area were made : one the year before clearance, a second during the clearance year, and a third after clearance. Snails were collected from all control canals, counted, and returned to the water with as little disturbance as possible. Snails collected from experimental canals were kept and examined for infestations. The reproductive cycle of both *P. boissyi* and *B. contortus* is about two months. The time required for their food plants to grow after being weeded out is also about two months, so we chose a two months' interval between clearances in order to deprive the snails of food and disturb their sexual activities. The government's winter closure of the canals in December leaves the canals dry so that silt may be removed. The water is returned in February. Some snails which survive this dry season will be at their peak of reproductivity in April. April was therefore chosen for our first clearance.

" Clearances required the use of three gangs of 10 men each and 3 overseers. It was carried out during low water and took 6 to 7 days. This left the canals aligned, free from weeds, and with a minimum of snails. The only special implements used were nets made with steel frames covered with three grades of wire netting and designated chicken-wire, coarse, and fine nets. The nets have large handles and are sturdily built for rough usage. The netting is stretched flatly over the frames at the front edge and bellies at the heel of the frame.

" *P. boissyi* reduction in the experimental area was as follows : preclearance year, 7,359 ; clearance year, 1,499 ; postclearance year, 134. Simultaneously there was the following increase in the control area : preclearance year, 1,922 ; clearance year, 2,172 ; postclearance year, 2,632. *B. contortus* reduction in the experimental area was as follows : preclearance year, 3,776 ; clearance year, 1,073 ; postclearance year, 648. During the same period the control area yielded the following numbers : preclearance year, 2,768 ; clearance year, 2,130 ; postclearance year, 1,816. These reductions are presented by months in two tables and three graphs.

" Clearances over a period of years instead of only one year would have shown greater reductions. One year's work is insufficient to produce the desired results. Even so, the reductions are significant and gratifying."

C. L.

Cawston (F. Gordon). **The Resistance of** *Melanoides tuberculata* **(Müller) to Schistosoma.**—*Jl. Trop. Med. & Hyg.* 1937. Jan. 15. Vol. 40. No. 2. p. 16.

" The control of schistosomiasis in the Far East is handicapped because the intermediate hosts are operculated and resist desiccation. Though Melanaidae are represented, there is no evidence that schistosomiasis in South Africa is spread by any mollusc possessing an operculated shell."

C. L.

Cawston (F. G.). **The Control of the Bilharzia Snail-Host in South Africa and Other Countries.**—*Jl. Trop. Med. & Hyg.* 1937. Mar. 1. Vol. 40. No. 5. pp. 56–57.

The Government of the Union of South Africa deals effectively with anything liable to spread disease among stock, and with noxious weeds. It does not so deal with the snail host which spreads bilharziasis in man. *C. L.*

Suga (Yukio). Beiträge zur statistischen Kenntnis der Distomiasis. [**Contribution to the Statistical Knowledge of Distosomiasis.**]—*Okayama-Igakkai-Zasshi* (*Mitt. d. Med. Gesellsch. z. Okayama*). 1937. Mar. Vol. 49. No. 3. [In Japanese pp. 624–634. [47 refs.] German summary pp. 623–624.]

In the Pathological Institute of the Medical Faculty, Okayama, 545 necropsies have been made during the last 14 years and liver infection with "Distomum spathulatum" [*Clonorchis sinensis*] was found in 43 (7·89 per cent.). The mean weight of the liver was 1,617 gm., most of the subjects being aged. Gall-stones were 2·5 times commoner in those with this infection than in the necropsies as a whole (as 11·63 to 4·48 per cent.). In 34·88 of the infections there were flukes in the gall bladder. In 24 infected persons there were more than 100 cc. of fluid in the abdominal cavity, in 10 marked jaundice, in 23·28 per cent. of the infected there was carcinoma of the liver. In 5 bodies flukes were present in the pancreas. *C. L.*

Hsü (H. F.) & Chow (C. Y.). **Studies on Certain Problems of** *Clonorchis sinensis*. **II. Investigation in the Chief Endemic Centre of China, the Canton Area.**—*Chinese Med. Jl.* 1937. Mar. Vol. 51. No. 3. pp. 341–356. With 8 figs. on 4 plates.

A continuation of the work of Hsü and Khaw [this *Bulletin*, 1937, Vol. 34, p. 395]. On the intensity of infection the authors have not worked from lack of time, but quote the work of others. Of the raw fish dishes favoured by the inhabitants they give details. Of 13 sorts of fish examined the tabled results are as follows for the six species cultured and commonly eaten raw: in 6 *Ctenopharyngodon idellus* 1,757 cysts, in 24 *Mylopharyngodon aethiops* 27 cysts, in 21 *Hypophthamichthys molitrix* 4 cysts, in 6 *H. nobilis* 2 cysts, in 8 *Labeo collaris* 59 cysts, in 13 *Cyprinus carpio* 2 cysts. Other notable figures are—in 6 *Pseudorasbora parva* 340 cysts and in 8 *Squaliobarbus curriculus* 34 cysts, the gills of the last being commonly fed to cats and dogs, so that the source of their infection is, it may be concluded, different to that of man. The food of these pond fish is in part faeces from privies set up over a corner of the pond; but of the snail host which intervenes in the life history between man and fish the information is at present unsatisfactory though the matter is being followed; there were in the mud of all these ponds *Bithynia longicornis*, and in that of some *Parafossalurus striatulus*; on crushing 190 of the former no Clonorchis cercariae were seen and in 470 of the latter one only. Propaganda and means of prevention are considered and the names of the 40 intermediate hosts and of the workers by whom they have been incriminated are listed. *C. L.*

Robert (J.). Considérations sur quelques cas de distomatose hépatique à *Clonorchis sinensis* chez des Chinois de la Côte-Est de Madagascar. [**Clonorchiasis among Chinese in Madagascar.**]—*Bull. Soc. Path. Exot.* 1937. Feb. 10. Vol. 30. No. 2. pp. 208–211.

In Madagascar the hawkers are Chinese and Robert reports 7 of them with Clonorchis infection, of whom 2 died and were submitted to necropsy. Their symptoms were those of hepatic congestion and a severe anaemia with effusions. Clonorchis eggs were seen in

the stools of all, and this is the only intestinal parasite mentioned. The possibility of the local spread of the infection is raised but not answered. *C. L.*

Biggart (J. H.). **Human Infestation with** *Fasciola hepatica.*—*Jl. Path. & Bact.* 1937. Mar. Vol. 44. No. 2. pp. 488–489. With 2 figs. on 1 plate.

A woman who had never left Scotland and who was in the Springfield Asylum, Cupar, Fife, for acute melancholia died from a retropharyngeal abscess, and in her bile ducts were found about a dozen flukes 2·5 cm. long, 1·3 cm. wide and having "the gross and microscopic characters of *Fasciola hepatica*." The liver weighed 36 oz., was hard, fibrous, with dilated bile ducts, the glands of the mucosa being often 1 mm. or more long, and the stroma round them infiltrated with eosinophil and plasma cells. In the liver parenchyma was marked biliary cirrhosis, eosinophil filtration and many new bile ducts.

C. L.

Chen (H. T.). Quelques observations sur un cycle évolutif de *Paragonimus* dans le sud de la Chine. [**On the Development of Paragonimus.**]—*Ann. Parasit. Humaine et Comparée.* 1937. Mar. 1. Vol. 15. No. 2. pp. 155–161. With 5 figs.

In the mollusc *Assiminea lutea* [this *Bulletin*, Chen, 1937, Vol. 34, p. 17] the development has been followed naturally and experimentally. The number of sporocysts in one snail varies from 1 to 9, they are whitish with dark striae, are easily got from the lymphatic system by dissection, are generally ellipsoidal when young and elongated when old, and contain not more than 26 rediae of the first generation; the mean measurements of 9 rediae were 0·369 × 0·202 mm.; they make their appearance about the 26th day. Within them are formed rediae of the second generation, a figure showing 16 of them on the 38th day. As to cercariae, they swarm round joints of the legs of *Sesarma* crabs (*vide loc. cit.*) but penetration has not been seen, though failing this within 15 minutes they encyst on carapace or legs, an observation believed to be new. *C. L.*

Rodriguez-Molina (Rafael) & Hoffman (William A.). **The Concomitance of** *Endamoeba histolytica* **and** *Hymenolepis nana.*—*Puerto Rico Jl. of Public Health & Trop. Med.* 1937. Mar. Vol. 12. No. 3. pp. 295–299. [Spanish version pp. 300–305.]

A mulatto of 22 harboured *H. nana*, *N. americanus*, *T. trichiura*, *E. histolytica* and *G. lamblia*, and had diarrhoea and tenesmus but no blood in the stools.

Emetine hydrochloride gave some relief to the symptoms, yatren caused amoebae and practically all symptoms to disappear, but intermittent diarrhoea went on. On 7 occasions male fern was given. After the first 6 of these treatments 22,493 *H. nana* were identified, after the seventh a conservative estimate by volume put the number as 441,000 more; but the infection persisted and attacks of diarrhoea came on when there were many onchospheres in the stool. It is suggested that a concomitant amoebic infection favoured a heavy autoinfection. Oil of chenopodium was not given, it being held from experience that amoebiasis contraindicated it. *C. L.*

GRAHAM (H. Boyd). **Hydatid Disease in Children.**—*Med. Jl. Australia.* 1937. Feb. 6. 24th Year. Vol. 1. No. 6. pp. 206–214.

A survey of the children admitted to the Children's Hospital, Melbourne, since 1900.

For the 3 complete and the fourth incomplete decades the yearly averages of admission for hydatid infection have been 7·4, 3·6, 2·8 and 2·2, and in these 151 children the sites of cysts have been: liver 87, lung 37, liver and lung, brain, abdominal wall each 6; peritoneum and kidney each 2; pelvis, femur, rib, spine and orbit each 1. In more detail are given the 74 children who came under the author's own care. The distribution of the cysts is given by age, and it is seen that multiple cysts in the liver are common in them—9 of 40 children in whom the liver alone was infected, the liver being also implicated in 22 in whom there were cysts in the lung. Suppuration has been commoner than expected, arising from rupture of the cyst. Daughter cysts were present in 12 children and before labelling a cyst as sterile a scraping from its inner surface should be looked at under the microscope for scolices; the formation of daughter cysts is considered as coming into being when the scolices in the mother cyst are threatened with destruction by suppuration, new ones formed in daughter cysts being safer from death. The growth of one child was interfered with, but when the cysts were taken away she more than doubled her weight in a few months (27 to 58 lbs.). The intradermal test has been of great value but owing to lack of standardization it is felt the author's case records do not add anything of scientific value. Complement fixation was apt to rise greatly after operation and to persist for some months; and its extent before operation was evidently a measure of the amount of antigen which has escaped from the cyst. Prognosis is good even after rupture and suppuration, provided the child is over 4; two of the nine deaths were in those under this age. Of the others the cyst in one was in the kidney and was large with a severe operation; two were in the liver, one child having congenital syphilis, the other a tuberculous hip joint; three were in the brain, the cyst not being removed in two and being of long standing with severe pressure in the third; the ninth was in the spine necessitating laminectomy. The features of the cysts in special localities are illustrated by case records. *C. L.*

KNEEBONE (J. Le M.). **Hydatid Disease: a Survey of Sixty Cases.**—*Med. Jl. Australia.* 1937. Feb. 6. 24th Year. Vol. 1. No. 6. pp. 201–206.

"There were six deaths. Three patients died from sepsis occurring in liver hydatid; two of them died unoperated on and with the condition undiagnosed. One patient with a pulmonary hydatid cyst died from pneumococcal meningitis a week after removal and closure of a cyst which had been complicated by pleurisy some weeks previously. A second died of tuberculous meningitis while still unoperated on, but this patient cannot be included as dying from hydatid disease. One patient with liver hydatid and secondary peritoneal echinococcosis died after numerous operations. One patient with hydatid of the liver died of pulmonary embolism three weeks after operation.

"Of the remaining 53 patients, one is still awaiting operation. The others have been operated on and are well at present or have died from other diseases. The majority of those who are alive are probably cured, but several will doubtless need operations for secondary cysts in the future." *C. L.*

Senevet (G.), Witas (P.) & Lièvre (H.). L'épidémiologie du kyste hydatique en Algérie. [**Prevalence of Hydatid in Algeria.**]—Ve Congrès Annuel de la Federation des Sciences Médicales d'Algérie, de Tunisie et du Maroc (Oran, 10–13 avril 1935).—19 pp.

In Algeria there have been reported 1,896 hydatic infections in man among 4,792,418 inhabitants, the habitat percentages being liver 67, spleen 3, lung 13, peritoneum 4, other organs 13. In animals killed in 3 abattoirs the percentage of infection in not less than 50,000 sheep in each place have been—for liver 6, 10 and 9 and for lung 6, 16 and 10; the corresponding figures for oxen are 11, 15 and 13, and 12, 17 and 12. As to the strobiles in dogs the percentages of infection in two series have been 6 and 12. *C. L.*

Wydrin (A.). Ein Fall von Herzechinococcus.—*Wien. Klin. Woch.* 1937. July 30. Vol. 50. No. 30. pp. 1135–1137. [10 refs.]

Repetto (Roberto L.). Hidatidosis costal.—*Prensa Méd. Argentina.* 1937. May 26. Vol. 24. No. 21. pp. 1052–1083. With 12 figs. [56 refs.]

Penfold (W. J.), Penfold (H. Boyd) & Phillips (Mary). *Taenia saginata*: **its Growth and Propagation.**—*Jl. Helminthology.* 1937. Jan. Vol. 15. No. 1. pp. 41–48.

The points considered are the length, colour, rate of growth, full number of segments, number of eggs in a ripe segment, and life span of *T. saginata*.

The report is based on 200 specimens. When contracted the length was from 9 to 20 feet, when relaxed from 15 feet (700 segments) to 32 feet (950 segments), though the latter when touched contracted to 10 feet. The colour was usually a light cream with mature segments often yellow especially at their edges. In one patient, they were always grey. Leuckart's occasional green margins the authors have never seen. The mean rate of growth is believed to be 8 or 9 segments a day, the estimates of other workers being considered. The number of segments in a complete worm is usually 800 to 900, their smallest and greatest numbers being 700 and 950 when, as usual, the anterior ones had been counted by a low-powered microscope. As to life span, it is believed to be usually as long as the host lives, though they know of one instance of spontaneous cure. The mean numbers of onchospheres estimated by dilution counting of those expelled by manipulation and by examination of the segment after this is in the order of 80,000 (5,000 to 130,000). The mean number of these passed daily is then about 720,000. In the author's first 83 patients, there had been a mean duration of infection of 13 years and a mean of 2½ worms on a total of 8,000 million eggs passed by each patient while infected [and infection of man being relatively so rare, this is some suggestion of the chances against any onchosphere growing into an adult worm.]

C. L.

Maplestone (P. A.). **The Eggs of *Taenia solium* and *Taenia saginata*.**—*Indian Med. Gaz.* 1937. Mar. Vol. 72. No. 3. pp. 149–151.

"The statement by Southwell (1930) that the eggs of *T. solium* and *T. saginata* are indistinguishable has been shown to be correct, and a study

of the literature has revealed an excellent example of the all too common habit that authors have of taking a statement from older publications and copying it year after year without it being put to the proof of correctness."

In examination of the literature the author notes that several have stated that the two can be distinguished by stool examination when only eggs were seen. *C. L.*

Schapiro (Mark M.). **A Quantitative Study of Egg Production in** *Taenia saginata*.—*Jl. Parasitology*. 1937. Feb. Vol. 23. No. 1. pp. 104–105.

Schapiro counted the eggs in 4 terminal gravid segments from 4 *T. saginata* preserved in 70 per cent. alcohol. These were dissected in 10 per cent. glycerin-alcohol mixture and the freed uteri gently teased to liberate ova. These ova were counted by the drop method, and in what was left of the segments when those had been made into press preparations. The mean was 123,810 (115,956 to 131,664). Accepting Cobbold's estimate of 400 gravid segments a month there are in that number 37,143,000 eggs at any one time. The theoretical possibilities of infection of man are given. *C. L.*

Ryo (Sai). **A New Anthelmintic "Raigan" in Taeniasis.**—*Jl. Oriental Med.* 1937. Apr. Vol. 26. No. 4. [In Japanese pp. 799–845. [64 refs.] English summary p. 62.]

The author has been investigating old Chinese drugs and comparing the results of their employment with those used in modern medicine. *Omphulia lapidescens*, known as "Raigan," a fungus growing where bamboo flourishes, has been used for at least two thousand years in China for infestations by Taenia, Ascaris and Enterobius. The author tested the crude drug powdered, giving 20 grains three times a day for four days in four cases of *T. solium* infestation, sixteen of *T. saginata*, the same number of *H. nana*, two of *H. diminuta*, and five of *D. caninum*. It proved most successful with all of these. He found it ineffectual in nematode infestations, by Ancylostoma, Ascaris, Trichuris or Enterobius; it is selective for Cestodes. *H. H. S.*

Penfold (W. J.) & Penfold (H. B.). *Cysticercosis bovis* **and its Prevention.**—*Jl. Helminthology*. 1937. Jan. Vol. 15. No. 1. pp. 37–40.

A further report [see Penfold, Penfold & Phillips, this *Bulletin*, 1937, Vol. 34, p. 22] on acquired immunity of cattle to infection with *Cysticercus bovis*, and its bearing on the prevention of infection of man by *Taenia saginata*.

These cattle were fed on ground on to which the Melbourne sewage had been run (for which reason cattle fed there may not be used for human consumption) and as controls of local infectibility 24 oxen were fed on onchospheres of *T. saginata* and all became infected. Seven other cattle were fed with 400,000 of these onchospheres and after 54 and 70 weeks and 23 months, two, two and three of them respectively were fed with eggs which had infected all other cattle so treated; yet, none of these seven got infections which the writer's experience enabled them to put down to this second infection. In the same way 20 oxen grazed on such a sewage farm for 4 years, and then drenched with 400,000 onchospheres each showed no second

infections. An immunity had come about. The eggs so used were only 2 days old and had it seems been kept in saline in a refrigerator at +2°C. *C. L.*

Urechia (C. I.). Sur quelques cas de cysticercose du système nerveux. [**Cysticercosis of the Central Nervous System.**]—*Bull. Acad. Méd. Roumanie.* 1937. 2nd Year. Vol. 3. No. 1. pp. 19–33. With 12 figs.

A detailed report of 6 mental or epileptic persons with cysticerci in the brain or spinal cord. *C. L.*

Alexander (A. J. P.). **Epilepsy and Cysticercosis.**—*Brit. Med. Jl.* 1937. May 8. pp. 966–967.

In this case a radiogram of the chest, taken because there were signs of tuberculosis at the right apex with tubercle bacilli in the sputum, showed puzzling small calcifications in the neck. Further radiograms of abdomen and thighs showed, as is well seen in the figure, several dozen elongated shadows of cysticerci. The man served in the army in Egypt and India. "Cases of this nature are undoubtedly a great rarity." *C. L.*

Minchin (R. L. Haviland). **Cysticercosis as a Cause of Epilepsy in a Diabetic Indian.**—*Lancet.* 1937. Apr. 10. pp. 865–867. With 2 figs.

"A case is described of epilepsy in a diabetic Indian due to infestation of the brain with *Cysticercus cellulosae*. This is the first noted in an Indian." *C. L.*

Tso (Chun-Te). **Intraocular Cysticercosis.**—*Chinese Med. Jl.* 1937. Apr. Vol. 51. No. 4. pp. 545–548. [14 refs.]

The cysticercus with its sucker and hooks could be clearly seen in active movement with the ophthalmoscope, though the figures of it mentioned in the text are not bound in the copy received. The man often ate pork and had had a tapeworm. There were no subcutaneous nodules or fits. *C. L.*

MISCELLANEOUS.

ANIGSTEIN (Ludwik). **Medical Exploration in Liberia.**—*Bull. Health Organisation. League of Nations.* Geneva. 1937. Feb. Vol. 6. No. 1. pp. 93–127. With 24 figs. on 11 plates and 1 folding map. [23 refs.]

——. Résultats de l'exploration sanitaire et médicale entreprise en 1935–1936 dans la république de Libéria.—*Bull. Office Internat. d'Hyg. Publique.* 1937. May. Vol. 29. No. 5. pp. 946–952.

Three expeditions have been made by Anigstein in Liberia. An account of the third was published in this *Bulletin*, 1937, Vol. 34, p. 431. Here we have a comprehensive article giving the results of all three journeys, the object of which was to study the distribution and incidence of endemic diseases, especially in the interior.

He visited the coastal plains, the rolling country of the hinterland, and the mountains on the Guinea border. An account is given of the geography and history of the country, the anthropology and ethnology, the climate and health conditions. The principal diseases are those generally met with on the West Coast—malaria, yellow fever, yaws, leprosy, smallpox, sleeping sickness, and tropical ulcer.

Malaria.—It was difficult to obtain blood samples but in respect of 4,195 children the spleen was palpated. In 33 of 51 localities the spleen rate exceeded 50 per cent. and the parasite rate averaged 46 per cent., in all cases *P. falciparum* ; no gametocytes were seen. In spite of these hyperendemic conditions the physical state of the people was excellent and the author contrasts their state with the cachectic patients he has seen in Siam and elsewhere.

Yellow fever.—No endemic focus was found. Of 20 blood samples taken from three different localities two were positive to protection tests. Of 97 blood samples obtained by RICE and HARLEY in 1932, six were positive. This rate is low compared with the West African colonies, British and French.

Yaws.—Of 9,493 adults examined 2,552, or 26 per cent., had tertiary symptoms. Topographical differences are noted and the disease was found to be more common in men than in women in all the tribes. *Sleeping sickness.*—Sporadic cases or small foci were noted. *Filariasis.*—Blood examination on any large scale was impracticable. Elephantiasis was found in 20 of 14,000 natives. *Tropical ulcer* was very prevalent and *goitre* was endemic on high ground.

A " Liberian Health Service " was created in 1932. It consists of a Director of Public Health, 11 European doctors, 3 of whom practise in Monrovia and the rest are missionaries, and 5 Liberians who practise as doctors though not adequately trained. The hospital in the capital is directed by a herbalist. In the whole country there are 150 hospital beds, of which 100 belong to the missions. There is no health service at the ports but, fortunately, owing to the bar at Monrovia and elsewhere, there is no direct contact between ships and shore.

The difficulties in the organization of a health service arise from lack of doctors and scarcity of funds. The public health allocation is 20,000 dollars, 4,000 of which go to the Monrovia hospital. A health service similar to that of Sierra Leone would " absorb the whole Liberian budget." Suggestions are made to improve matters, among them the importance of training an auxiliary health staff which would instil health notions into the tribes. *A. G. Bagshawe.*

Clastrier (J.). Contribution à l'étude de la pathologie de l'Aurès (Algérie). [**Diseases seen in Aurès, Algeria.**]—*Arch. Inst. Pasteur d'Algérie.* 1936. Dec. Vol. 14. No. 4. pp. 449–557. With 17 figs. (2 maps) & 18 plates. [21 refs.]

This long paper, freely illustrated with excellent photographs, consists of three parts. The first treats of the country, its climate, the housing, habits, and customs of the people, their local migrations, their diet; in the second are described the diseases met with, and in the third the natural history of the region.

In February 1935, at the instance of the Health Organisation of the League of Nations, the Pasteur Institute of Algeria undertook an enquiry into the curative and preventive action of quinine and certain synthetic drugs in regard to malaria and established a station in the valley of Oued el Abiodh, where the author spent 14 months. The mountainous massif called Aurès is situated in the south of the Department of Constantine; owing to the difficulties of communication it is isolated and the valley of the Oued el Abiodh is the least known part. The population of the area dealt with here is 2,021. The account of the pathology of the valley is based on this 14 months' out-patient practice, supplemented by enquiries.

Malaria is the chief disease and is endemic; in a 1933 epidemic almost all the babies perished. Tables give four indices, splenic, splenometric [*i.e.*, "relative hypertrophy of the spleen"], plasmodic and gametic, with actual figures as well as percentages for subjects above and below 15 years. For children the indices were 44·4, 152, 9·2, and 3 [the significance of the second figure is not stated, the others are percentages]. Of the parasites 65·7 per cent. were *falciparum*, 21·1 *vivax*, and 12·7 *malariae*.

A. hispaniola is found breeding after the rains in shallow, sandy pools invaded by filamentous algae. In the marshy bed of the river are found *A. maculipennis*. *A. marteri* occurred in clear rocky pools but are shown not to contribute to the malaria. The breeding grounds of these and other mosquitoes are described in much detail.

Tuberculosis.—To estimate the extent of this infection the author used von Pirquet's reaction with the technique of Parrot and Foley: 694 subjects were examined, only 17 below 12 months of age. The index for children (up to 15) was 55·5 and for children and adults 74 per cent. This, the author remarks, is very high for Algeria. Clinical signs of the infection are rare. Pulmonary tuberculosis was only once seen.

Relapsing fever.—No epidemic was observed but in the routine blood examination for malaria spirochaetes were seen 4 times. Only one of the subjects had fever. Lice are generally harboured.

Syphilis is about as frequent as in other groups of N. African natives. A primary sore was seen only once. Gummata and nasal perforations were "legion." Aortitis was common, especially among women. Of manifestations of congenital syphilis osteoarticular forms were most frequent.

Ophthalmia and Eye Affections.—For a month the eyes of all persons who came under examination were systematically inspected. The author gives tables and graphs of the trachomatous findings and sums up thus:—Trachoma is extremely widespread (76 per cent. of persons examined). It is relatively benign for out of 240 infected 58·6 per cent. had lesions which evolved without complications. From the age of

5 children are infected in the proportion of 59·3 per cent., but the lesions disappear in 6·2 per cent. (1 in 16). Among 316 subjects there were found only 7 cases of trichiasis, 2 of traumatic pannus and no true pannus; *i.e.*, 2·8 per cent. had these sequelae. In an epidemic of summer conjunctivitis the bacillus of Weeks was usually found (34 times in 61 cases).

Ringworm.—Of 321 children under 16, 26 had ringworm, and more boys than girls (14 per cent. and 5 per cent.); in 21 cases it was favus, in 5 trichophytic. The author concludes that circumscribed forms are commoner than in other regions of N. Africa, that symptoms are slight and that spontaneous cure may occur early.

Leishmaniasis.—One case of Oriental sore, microscopically confirmed, was seen in a shepherd boy who had never left the region. Nine species of Phlebotomus were found by Parrot among specimens collected here.

Intestinal Parasites.—Owing to the almost insuperable objections of the natives few stools could be examined. Of those of 47 children 38 contained *A. lumbricoides*.

Among other affections one notes that three children, aged 3, 5 and 14, died of scorpion sting. The most dangerous species is *Prionurus australis*.

No cases of dysentery were seen though the river serves both as sewer and source of drinking water.

Native methods of treatment of all the diseases described receive full attention. *A. G. Bagshawe.*

Morales Otero (P.), Perez (Manuel A.), Ramirez Santos (R.), Espino (Rafaela), Ramú (Adriana), Fuster (J. L.), González (Dolores) & Marrero (Mario). **Health and Socio-Economic Studies in Puerto Rico. I. Health and Socio-Economic Conditions on a Sugar Cane Plantation.**—*Puerto Rico Jl. of Public Health & Trop. Med.* 1937. June. Vol. 12. No. 4. pp. 405–490. With 8 figs. & 1 map. [Spanish version pp. 491–498.]

This is a long article dealing with a large number of subjects. The objects of the investigation were to ascertain the health and socio-economic conditions of the people living at Central Lafayette when it was acquired by the Puerto Rico Reconstruction Administration, regarding this as an index of rural conditions in the island, especially among those engaged in the sugar-cane industry. The data were obtained by visits to every house by sanitary inspectors, trained nurses and social workers; if any sick were found the doctor was called in. The sanitary inspectors recorded the condition of the dwelling and its environs; the social worker recorded facts regarding education, religion, occupation, weekly earnings, and information was collected even on such purely personal matters as the character of the furniture, the food consumed, the income and how it was spent, whether there were debts and so on.

Following is part of the authors' summary :—

" 1. The area surveyed is a middle-sized, absentee-owned sugar cane plantation situated in the south-eastern part of Puerto Rico.

" 2. The area includes 16·1 per cent. of the rural population of the municipalities of Arroyo, Patillas and Maunabo, in which the plantation is located. The population . . . is very stable, predominantly colored . . .

" 3. Most of the houses are wooden, and roofed with galvanized iron. Nearly three-fifths of the houses have from 100 to 299 sq. ft. of floor area

and approximately one-half of them have from one to four exterior doors or windows. Half of the houses are property of the families living in them and two-fifths are property of the Central. The average number of rooms per dwelling is 2·5. More than half of the population live in houses of only two rooms. About one-third of the families have water piped to the house and the rest use water from shallow wells, rivers and streams, and rain water. Forty-three per cent. of the houses do not have sanitary conveniences of any kind; about one-half of them have latrines and nearly 5 per cent. have water-closet installations . . . . . .

" 5. The most prevalent diseases are malaria, gastro-intestinal disorders and tuberculosis. The highest mortality recorded in the three municipalities is from the above-mentioned causes. In Arroyo and Patillas the mortality from malaria is more than double the average mortality for Puerto Rico from the same cause.

" 6. More than three-fifths of the sick persons found in the area were not receiving medical care of any kind.

" 7. The malaria problem is the most serious health problem. Of the cases found, 90 per cent. were malaria cases, four-fifths of which were healthy carriers. Nearly four-fifths of the persons examined harbored parasites of one kind or another in their intestines. Of these, 38 per cent. had a mixed infestation and 46 per cent. were positive for uncinaria. A few advanced cases of tuberculosis were found and nearly three-fifths of the persons tested reacted positively to the tuberculin test. Eight per cent. of the samples taken for syphilis gave a positive result.

" 8. The family constitutes the labour unit dependent upon the Central for its existence. Three-fifths of the families are composed of five members or less; the average size of families is 5·1 members . . . . .

" 9. The consensual marriages include 26·6 per cent. of the population 15 years of age and older, and 46·6 per cent. of the total married population . . . . .

" 10. Nearly two-fifths of the persons ten years of age and over have never been in school; two-fifths have completed from 1–4 grades in school; 16 per cent. have completed from 5–7 grades and only 4·7 per cent. have completed the eight grades of the elementary school. More than three-fifths of the population with any grade of instruction have been in school only from 1–4 grades . . . More than half of the heads of families (52·3 per cent.) never have been in school and 30 per cent. of them have from 1–4 grades of school.

" 11. More than two-fifths (43·5 per cent.) of the persons under 15 years of age are illegitimate. Among children under one year of age the percentage of illegitimacy is 58·2 and 52·2 in children 1–4 years of age.

" 12. Of the total number of workers on wages, 80 per cent. are unskilled farm laborers and 20 per cent. skilled and semi-skilled workers. The former work an average of 34·1 weeks and the latter 39·9 weeks during the year. Only 10 per cent. of the farm labourers and 41 per cent. of the skilled workers have work during the whole year . . . .

" 13. Nearly two-thirds of the expenditures are spent in food and there are budgetary deficiencies fluctuating from 7 to 75 per cent. in all families earning less than $6 per week.

" 14. One-fourth of the families have garden plots and more than four-fifths of them possess property of one kind or another. Similarly, more than four-fifths of the families in the wage-earners' group have accumulated debts, two-thirds of which were incurred for food." *H. H. S.*

DREOSTI (A. O.). **Pathological Reactions produced by Work in Hot and Humid Environment in the Witwatersrand Gold Mines.**—*South African Jl. Med. Sci.* 1937. Apr. Vol. 2. No. 2. pp. 29–36. [18 refs.] [Summary appears also in *Bulletin of Hygiene.*]

The physiological reactions to work in a hot and humid environment vary greatly in degree in different subjects. During investigations of

the pathological effects of work in such atmospheric conditions several subjects had to be removed from the experimental chambers owing to collapse. These gave a typical picture of cardiac syncope; in no case was there a hyperpyrexial temperature. Many natives appeared to be perfectly happy with a temperature of 104°F. These suffered no cardiac embarrassment, but had inefficient control of rise in body temperature. Hard manual work in hot places may lead to heat collapse (or heat exhaustion or heat syncope) or to heat stroke (or heat-hyperpyrexia, thermic fever, or siriasis).

The symptoms and signs of heat-collapse are those of a fatigued heart, namely, headache, dizziness, general feeling of weakness or collapse. The discomfort due to these symptoms prevents further muscular work, and heat collapse is thus in a sense protective. Debilitated workers are more prone to heat-collapse than normal subjects. The abnormal strain of work in a bad underground environment may, in diseased subjects, bring about complete breakdown in the heart's action with subsequent death.

Heat stroke is a condition of acute mental excitement with delirium, convulsions, muscular twitchings or tremors, and is always associated with a high body temperature. The causative agent in the body has not been established: hyperpyrexia is only an accompaniment, not the cause. Unlike heat collapse, heat-stroke only occurs in unacclimatized subjects. The onset and course of the condition are acute, and anticipatory treatment therefore impossible. Heat-stroke is preventable by control of the working environment together with suitable acclimatization. *T. Bedford.*

Sollier (L. F.) & Boutareau (C.). Un cas de mélioidose à manifestations cliniques prostato-urinaires. [**Melioidosis with Signs of Prostatitis.**] *Bull. Soc. Méd.-Chirurg. Indochine.* 1937. Jan. Vol. 15. No. 1. pp. 8–10.

A corporal, 38 years of age, reported sick with a history of feeling fatigued and having had fever for 6 days, his temperature was 39°C. He had been taking quinacrine for some days without benefit. The following day he had retention, necessitating catheterization; there was no pain until two days later when the prostate was swollen and tender on the left side. His temperature then was 40·5°C., Widal reaction was negative to the enteric group, to *Proteus X19*, and W.R. negative. Prostatic abscess formed and was opened and drained, but the patient died next day, six days after reporting sick. Post-mortem revealed congestion of both lungs with miliary abscesses at the left base, enlarged liver and spleen and an abscess at the upper pole of the right kidney. Cultivation had been tried with pus from the prostatic abscess and with blood taken on the day before death; in both cases a pure growth of *Pf. whitmori* was obtained. The source of his infection was not determined. *H. H. S.*

Cicchitto (Angelo M.). Sul "Bigio" [**Bigio.**] *Policlinico.* Sez. Prat. 1937. Apr. 26. Vol. 44. No. 17. pp. 823–824, 827–830, 833. With 1 fig.

The author gives an account of the clinical signs of Bigio [see this *Bulletin*, 1930, Vol. 27, p. 167, and 1931, Vol. 28, p. 860] and describes two cases. Briefly it is characterized by a superficial ulceration of the

lower lip, semilunar in shape, involving mainly the mucosa, not extending to the deeper layers nor accompanied by enlargement of the lymphatic glands. The condition is, the author states, far from uncommon in Somalia. He finds in these patients hypochromic anaemia and other signs of vitamin deficiency, in particular vitamins A and C. The treatment giving the best results he finds is the local application of Castellani's fuchsin lotion and parenteral administration of liver and suprarenal extract—parenteral because the natives are so heavily infested with helminths that absorption of medicaments is impaired. *H. H. S.*

MANDLIK (G. S.). **A Record of Rhinosporidial Polypi with Some Observations on the Mode of Infection.**—*Indian Med. Gaz.* 1937. Mar. Vol. 72. No. 3. pp. 143–147.

Details are given of 48 cases and a consideration of them much facilitated by a carefully compiled table. They comprise those seen between February 1931 and October 1936, and are divided into four groups: i. Poona, the place of infection being the river Mula-Mutha, near Sungum; ii. Manchar, infection a tank west of the city; iii. Satara, three tanks in the city, Mangalwar, Machi, and the municipal tank; iv. Old wells in Oundh and Yelliv.

From a study of the cases no common cause of infection was found, but it was localized to infected water and acquired in bathing and swimming, or diving; but probably mere bathing is not enough, for carters employed on the sand work escape. Floating spores may enter the skin and the closer and longer contact of swimming and diving plays a great part, the latter possibly by driving spores into the nasal mucosa. Many resist infection for years and catarrhal and inflammatory rhinitis are unfavourable to infection, due, it is suggested, to phagocytic action of the cells present. *H. H. S.*

KUILMAN (J.), KAISER (P. J.) & SARDJITO (M.). Rhinoscleroom in de Pasoemah-landen. With appendix by A. N. J. Th. à Th. VAN DER HOOP. **Rhinoscleroma in the Pasoemah Lands.**—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1937. Mar. 30. Vol. 77. No. 13. pp. 770–803. With 5 plates & 1 map. [22 refs.] German summary.

Since the existence of rhinoscleroma was first recognized in the Netherlands Indies by SNIJDER and STOLL in 1918, further records of this disfiguring disease have multiplied [see this *Bulletin*, 1935, Vol. 32, pp. 73, 521, and 1936, Vol. 33, p. 720]. It has been suggested that the disease has its chief incidence upon the older indigenous races, as exemplified by the animistic people of the Batak Lands, Bali and Chota Nagpur, the co-called "Munda Folk." In this category may be included the inhabitants of the Pasoemah Lands, who are the subject of the present study. These people, however, although of old stock, are Mohammedans and differ from the others mentioned in having a comparatively high standard of living and sanitation. They, at least, cannot be included among the "great unwashed."

The Pasoemah Lands form a plateau in the South eastern part of Sumatra and have as their chief town Pagar-Alam in the centre. It is an area of 1,600 sq. km., and has a population of about 61,000. A well-arranged survey scheme, in which all officials co-operated,

brought to light ten cases of rhinoscleroma ; this is a high proportion, unless the proportion is simply testimony to the efficiency of the search for cases.

One of the features of Pasoemah rhinoscleroma was that the lesions were by no means so extensive or disfiguring as those which have previously been described elsewhere and this is ascribed to the introduction of sanitation. Rhinoscleroma is, in fact, a disease which is dying out.

Laboratory tests were an important part of the investigation scheme, but the workers were at some disadvantage in that the material sent for examination took three days to arrive. Cultures were often rendered useless by the overgrowth of *Proteus* organisms. An interesting test which was applicable clinically and gave indication of its usefulness was the allergic reaction resulting from intracutaneous injection of antigen. This antigen was either a suspension of killed rhinoscleroma organisms or a filtrate of a bouillon culture. The reactions of rhinoscleroma sufferers were significantly greater than in non-sufferers, but it remains to be seen whether they are specific enough to differentiate rhinoscleroma from the diseases due to allied organisms of the capsule bacilli group, *ozaenae* and *Friedländer*. Good clinical photographs and bibliography accompany the article.

An interesting appendix deals with the anthropological question of the incidence of an ancient disease upon an ancient folk but ends with the commentary that " all is still vague and uncertain " in this regard.

W. F. Harvey.

Ikeda (K.). **Bronchopulmonary Moniliasis : its Relation to Obscure Chronic Pulmonary Infection.**—*Arch. Path. Lab. Med.* 1936. Vol. 22. No. 1. pp. 62–81. With 5 figs. [Summarized in *Rev. Applied Mycology*. 1937. Mar. Vol. 16. Pt. 3. p. 177.]

" Since Castellani's observations in 1905 on bronchopulmonary moniliasis among Cingalese tea workers, this condition has been regarded as a clinical entity. In the present study attention is drawn to the existence of an apparent relationship between a pathogenic species of *Monilia* (*M.* [*Candida*] *albicans*) and chronic interstitial pneumonia of obscure etiology, associated with bronchiectasis and abscesses. The results of the writer's investigations further suggest a sequential relation of a certain type of chronic bronchial asthma to bronchopulmonary moniliasis, the former representing an early phase of the latter. *C. albicans* may therefore be considered as an important etiological factor in the development of obscure bronchopulmonary infection, but whether it is the sole cause of the disease cannot be stated on the basis of present evidence."

Cavalcanti (Robalinho) & Bicca (J.). Ainhum. (Caso em um mestiço.)—*Hospital.* Rio de Janeiro. 1937. June. Vol. 11. No. 6. pp. 719–730. With 8 figs. [18 refs.] English summary (8 lines).

Vakaruru (Henry B.). **An Undiagnosed Condition which does not yield to Medical Treatment but yields to Fijian Medicine.**—*Native Med. Practitioner.* 1937. Jan. Vol. 2. No. 4. pp. 360–363.

The condition referred to is that of localized heat, swelling, tenderness, and most acute pain, in one patient affecting the dorsum of one foot, in the other two (one of whom was the author himself) the

scapular region. Treatment by sodium salicylate and potassium iodide internally or by injections of N.A.B., and glycerin and belladonna locally gave no relief. The condition seems to be well known to the natives, who call it *gata*, or *balei*, and they use local plants which gave in all these cases speedy relief. The botanical names of the plants are not mentioned; the author states that they are called Walai and Wakurukuru. "The skin of these . . . is peeled off, and the inside parts are then ground and wrapped up in coconut fibre. The whole is then kneaded in cold water which the patient then drinks, leaving a few drops for massaging the affected part." The editor of the journal adds a note saying that the condition is, in his opinion, a form of fibrositis and that the native drugs contain massive doses of salicylate.

H. H. S.

JORDAN (Edwin O.) & BURROWS (William). **The Vomiting Sickness of Jamaica, B.W.I., and its Relation to Akee Poisoning.**—*Amer. Jl. Hyg.* 1937. May. Vol. 25. No. 3. pp. 520–545. [18 refs.]

Vomiting Sickness is a condition which has been noted in Jamaica for more than half a century and at one time caused so many deaths in a short period, wiping out whole families in a day, that a veritable panic occurred in limited districts where the reviewer was carrying out investigations in 1915. The present article is the most complete which has been published since SCOTT's monograph in 1916, and should be read and studied by all interested in this, one of the most dramatic of food poisonings occurring in warm climates. If still obtainable, SCOTT's original article should be read in conjunction with the present, because many of the points there mentioned and discussed have been studied anew by the authors and carried further by fuller and more complete experimental work. The epidemiological evidence is more fully dealt with in SCOTT's article because he had the advantage of seeing a large number of cases, amounting to hundreds, in the course of some years, but the experimental work of Drs. Jordan and Burrows is much more detailed.

The authors state that the fatal issue occurs "usually within 3 to 4 days"; SCOTT's analysis of over 300 cases placed the average duration at about 12 hours. Another point of which no mention is made is the differences of character between the early and the late vomiting and of the calm interval of apparent recovery between them. Perhaps the authors had few opportunities of watching cases from start to finish. The initial vomiting is of an irritant type—gastric, the later typically cerebral—effortless pumping up of fluid material, from which, in SCOTT's experience, recovery never took place. Hundreds of lives have been saved by prompt treatment at the first onset of vomiting. The authors do not mention the histological fatty changes in the central nervous system.

The authors quote SCOTT regarding the effects of administering "an extract, made by boiling unopened ackees with water." This is correctly quoted, but was badly or misleadingly worded by SCOTT. The latter was testing the ackee as eaten by the people and he prepared the material in the same way as the people, namely, using the arilli; SCOTT meant "an extract, made by boiling the arilli of ackees which had not opened naturally"; he did not test the toxic effect of the husks nor of the seeds, because in preparing the food the people use only the arilli. The authors in their experiments have estimated the toxicity

of these parts also and have thereby done much excellent work in showing the marked toxicity of the seeds.

It is to be hoped that the authors will continue their studies with a view to isolating the toxic principle and evolving a reliable test for it; and this for two reasons: Firstly, as an interesting scientific discovery; secondly, because with the present inability of proof by analysis an undetectable method of homicide (and more particularly infanticide) is in the hands of any unscrupulous person. SCOTT's attempts at isolation of the poison failed; extracts were made with alcohol, ether, and petroleum ether, and alcoholic derivatives seem to have antidotal properties. Watery extracts are highly toxic and some way must be found of preserving these for analysis other than by addition of alcohol. It is noteworthy that the authors are of the opinion that the poison may be a glucoside. SCOTT made the same suggestion, because it appeared to be very unstable, readily decomposed by the gastric juices, and so made its recognition more difficult.

The reviewer calls attention to these points, not by way of cavil, but to urge further research. Those who have seen patients dying in numbers from inadvertently eating this food when in an unfit state, many of them hungry children on the way to school picking up unripe ackees off the ground, will welcome any work tending to clarify a problem of epidemiological and scientific interest, and the authors of the present article have done a great deal of useful and meritorious work to this end. *H. H. S.*

YU (K. Y.). **Some Observations on Atriplicism.**—*Jl. Oriental Med.* 1937. May. Vol. 26. No. 5. pp. 63–69. With 5 figs.

In 1898, J. J. MATIGNON described in Northern China, under the designation "Atriplicism," a condition which he believed was due to the ingestion of the shoots of the plant *Atriplex serrata* (*Chenopodium hybridum*), the symptoms being oedema of the face, hands and forearms associated with disturbances of motility, sensibility, circulation and trophic state of the skin of the hands, often complicated by crust formation in the oedematous areas.

Since then a few cases have been described by others and the name has already found its way into one or two text-books.

In 1935, Yu, who had recognized this condition among patients attending the clinic at Mukden, found that in some cases there was a history of ingestion of amaranthus instead of chenopodium and in one case neither had been taken. At the same time he came to the conclusion that the skin manifestations only occurred at such time and at such sites as there had been exposure to strong sun's radiation, thus agreeing with MATIGNON's observation that these cases are seen in May, June and July. Yu now suggests that the ingestion of these plants plays no part and that the condition should be described as a Light Sensitive Dermatosis and the term atriplicism discarded.

Yu cites five cases: a few hours after an exposure to bright sunshine marked oedema of the face and hands occurred including the palm so that the fist could not be closed; blistering and ecchymosis ensued followed by exfoliation. It was noted that the swollen parts felt cold and the radial pulse very poor. There was giddiness followed by unconsciousness.

[This syndrome is here described as it is in some ways suggestive of pellagra. Yu does not mention pellagra and attributes the condition

to simple sunburn in susceptible individuals. The cause of the susceptibility is not quite obvious and why the condition is not more common is unexplained. His article may, however, serve to draw the attention of others to the affection.] *H. S. Stannus.*

Stanesco (Mihail) & Enachesco (S. D.). L'érytrosédimentation dans la pellagre avec des troubles psychiques. [**Red Corpuscle Sedimentation in Pellagrins with Mental Symptoms.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Bucarest.* 1936. Nov. Vol. 18. No. 9. pp. 263–265.

The rate of sedimentation of red cells has been tested in a number of diseases and attempts have been made to estimate the clinical significance of departures from the normal. Thus in pneumonia, in acute articular rheumatism the rate is increased, returning to normal with convalescence. In pulmonary tuberculosis it is used for prognostic purposes, an increase being noted in progressing cases, a decrease with arrest.

The authors have examined eight pellagrins in their mental hospital and give the results after half an hour, 1 hour and 24 hours. Whereas in normal patients the fall in the first hour varies between 1 and 7 mm. (the higher rates in women), in these mental pellagrins it ranged between 21 and 74 mm. after 1 hour and 101–120 after 24 hours, a rate approaching that seen in acute pneumonia. The authors maintain that this indicates profound disturbance of the whole system shared by the cutaneous, digestive, circulatory and nervous organs.

H. H. S.

REVIEWS AND NOTICES.

JOYEUX (Ch.). [Professeur de Parasitologie à la Faculté de Médecine de Marseille, Ex-Médecin colonial] & SICÉ (A.) [Professeur à l'École d'application du Corps de Santé colonial de Marseille]. **Précis de Médecine Coloniale.** [Précis of Medicine in the Colonies.] —2nd Edition. pp. viii + 1250. With 240 figs. & 2 plates (1 coloured). 1937. Paris: Masson et Cie, 120 Boulevard Saint-Germain. [170 fr.]

It is just ten years since the publication of the first edition of this well-known *text-book* of tropical medicine, for such it is rather than what in England we should understand as a *précis*. (The first edition was reviewed in this *Bulletin*, 1927, Vol. 24, p. 858.)

The diseases are arranged according to the organ or system involved, as in the previous edition, but though this leads for example to the divorce of amoebic hepatitis from the section on intestinal amoebiasis any disadvantages which thus accrue have been well met. Each subject is dealt with, as in our own text-books, under sections: definition, history, geographical distribution, epidemiology, aetiology, pathogenic agent, symptomatology, etc.

The present edition is half as large again as the last, of necessity, but it is not overloaded in an attempt to make it "encyclopaedic"; systematic parasitology here finds no place but all the essential facts regarding protozoology, helminthology, etc., in their bearing on tropical medicine are reproduced, making a well balanced very readable book, well worth perusal by the English tropical practitioner in search of a change in reading, or on account of some slight differences in French medical thought.

On the whole the volume is well up to date though here and there omissions may be remarked or some point receives but scanty mention. Thus, the Paralytic Rabies transmitted by Bats in Trinidad and Brazil, HURST and PAWAN, 1931, is omitted; the typhus fevers of Malay receive but short notice; BRAY's work on infantile beriberi might with advantage have been included, as also a more up-to-date discussion upon the relationship of vitamin B_1 and that disease.

Attention is here called to the useful method of giving abbreviated bibliographical references adopted by the authors as worthy of more extended use. *H. S. Stannus.*

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE
By the South Essex Recorders, Limited, High Road, Ilford.

(1674) Wt. P1/181 1875 10/37 S.E.R. Ltd. Gp. 353.